



Earth’s Place in the Universe

First Grade

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Standards

NVACS – Science Standards

* 1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted.
* 1-ESS1-2: Make observations at different times of the year to relate the amount of daylight to the time of year.

Math:

* 1.MD.3: Tell and write time in hours and half hours using analog and digital clocks.
* 1.MD.4: Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many are in one category than in another.
* 1.OA.A.1: Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations to represent the problem.
* 1.MD.C.4: Organize, represent, and interpret, data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many are in one category than in another.

Engineering:

* K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
* K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
* K-2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Literacy:

* W.1.7: Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions.)
* W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
* RI.1.3: Describe the connection between two individuals, events, ideas, or pieces of information in a text.
* RI.1.9: Identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures.)
* SL.1.4: Describe people, things, and events with relevant details, expressing ideas and feelings clearly.
* SL.1.5: Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

Materials

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Qty.** |  | **Item** | **Qty.** |
| Computer | 1 |  | BrainPOP jr. Login  |
| Individual white boards | Class set (30) |  | White board markers | Class set (30) |
| Pencils  | Class set (30) |  | Science notebooks | Class set (30) |
| Crayons | Class set (30) |  | Paper | Class set (30) |
| Flashcards of Solar System objects | 1 set |  | Chart paper | 1 |
| Flour | 1 bag |  | Salt | 1 container |
| Vegetable oil | 1 bottle |  | Water | 5 gallons |
| Rocks | 1 box |  | Cake pan | 1 |
| Measuring cups | 1 set |  | Measuring spoons | 1 set |
| Bowls | 3 |  | Spoons | 1 box |
| Zippered sandwich bags | 1 box |  | Stick of butter | 4 |
| Microwave (access) | 1 |  | Dental floss | 1 package |
| Food coloring (red, green, orange, brown, yellow, blue) | 1 set |  | Cream of tartar | 1 container |
| Large pot | 1 |  | Stove (access) | 1 |
| Store-bought playdoh: red, green orange, brown, yellow, blue | 1 set |  | Baking soda | 1 container |
| Dishwashing liquid | 1 bottle |  | Vinegar | 1 bottle |
| Scissors | Class set (30) |  | Party hats | Class set (30) |
| Small plastic water bottles | Class set (60) |  | Funnels | Class set (30) |
| Paper plates | Class set (30) |  | Newspaper | 1 |
| Whole milk | 1 gallon |  | Cotton swabs | 1 box |
| Pitcher | 1 |  | Alka-Seltzer tablets | 3 packages |
| Glass jars with lids | Class set (30) |  | Small plastic water bottles with sports cap lids | Class set (30) |
| Hairspray | 3 cans |  | Liquid soap | 1 bottle |
| Cups | Class set (30) |  | Large tubs | 15 |
| Glitter | 1 container |  | Grey paint | 1 bucket |
| Marbles | 1 package |  | Paintbrushes | Class set (30) |
| Double-Stuf Oreos | 6 packages |  | Frosting | 4 tubs |
| Paper bowls | 6 |  | Popsicle sticks | 1 box |
| Light bulb | 1 |  | Lamp (access) | 1 |
| Foam balls | 3 |  | Large box | 1 |
| Large plastic water bottles (16 oz.) | Class set (30) |  | Duct tape | 4 rolls |
| Paint | Class set (30) |  | Foil | 4 rolls |
| Plastic cups | Class set (30) |  | Chalk | 1 box |
| Tape measure | 10 |  | Clip boards | Class set (30) |
| Compass | 1 |  | Flashlight | 1 |
| Globe | 1 |  | Heat lamp | 1 |
| Paper cups | 1 box |  | Individual calendars | 2 class sets (60) |
| Small skewers | Class sets (240) |  | Sharpies | Class set (30) |
| Large blank calendar | 2 |  | Black construction paper | 1 ream |
| Dark corn syrup | 1 bottle |  | Ammonia-based window cleaner | 1 bottle |
| Crushed dry ice | 2 cups |  | Heavy gloves | 1 set |
| Plastic trash bags | 1 box |  | Butterscotch candy | 1 bag |
| Nerds candies | 1 box |  | Snow Caps | 1 box |
| M&Ms | 1 large bag |  | Peppermints | 1 bag |
| Life savers | 1 large package |  | Lemon drops | 1 box |
| Whoppers | 1 box |  | Gum drops | 1 bag |
| Wax paper | 1 roll |  | Orange icing | 1 tube |

Books

(with myON links, if available)

National Geographic Readers: Day and Night by Shira Evans (no myON link available)

Eight Great Planets! A Song About the Planets by Laura Purdie Salas; <https://www.myon.com/reader/index.html?a=ss_planets_s10>

Planets by Martha E.H. Rustad; <https://www.myon.com/reader/index.html?a=sp_planets_s16>

Nearest to the Sun: The Planet Mercury by Nancy Loewen; <https://www.myon.com/reader/index.html?a=as_mercu_s08>

Brightest in the Sky: The Planet Venus by Nancy Loewen; <https://www.myon.com/reader/index.html?a=as_venus_s08>

Soil, Silt, and Sand: Layers of the Underground by Jody Sullivan Rake; <https://www.myon.com/reader/index.html?a=us_sss_f15>

Earth by Martha E.H. Rustad; <https://www.myon.com/reader/index.html?a=sp_earth_s16>

The Secrets of Mars by Kassandra Radomski; <https://www.myon.com/reader/index.html?a=pl_mars_f15>

The Largest Planet: Jupiter by Nancy Loewen; <https://www.myon.com/reader/index.html?a=as_jupit_s08>

Ringed Giant: The Planet Saturn by Nancy Loewen; <https://www.myon.com/reader/index.html?a=as_satur_s08>

The Sideways Planet: Uranus by Nancy Loewen; <https://www.myon.com/reader/index.html?a=as_uranu_s08>

Farthest from the Sun: The Planet Neptune by Nancy Loewen; <https://www.myon.com/reader/index.html?a=as_neptun_s08>

The Moon by Martha E.H. Rustad; <https://www.myon.com/reader/index.html?a=sp_moon_s16>

The Moon Book by Layne deMarin; <https://www.myon.com/reader/index.html?a=wr_moonb_f11>

The Sun by Martha E.H. Rustad; <https://www.myon.com/reader/index.html?a=sp_sun_s16>

Where does the Sun Go at Night? An Earth Science Mystery by Amy S. Hansen; <https://www.myon.com/reader/index.html?a=fgsm_sun_f11>

Seasons of the Year (Measuring Time) by Tracey Steffora; <https://www.myon.com/reader/index.html?a=mtime_ssnsy_s11>

Space by Martha E.H. Rustad; <https://www.myon.com/reader/index.html?a=sle_space_f13>

Show Me Space: My First Picture Encyclopedia by Steve Kortenkamp; <https://www.myon.com/reader/index.html?a=mfpe_space_s13>

There’s No Place Like Space: All About Our Solar System by Tish Rabe (no myON available)

Times of the Day by Tracey Steffora; <https://www.myon.com/reader/index.html?a=mtime_tmsday_s11>

Vocabulary

|  |  |
| --- | --- |
| **Word** | **Definition** |
| Absorb | To take in or soak up |
| Albedo | How reflective and bright something is |
| Atmosphere | The layer of gas held close to a planet by gravity |
| Asteroid | A chunk of rock and metal in outer space that is in orbit around the sun |
| Axis | A straight line about which a body or geometric figure rotates |
| Carbon dioxide | A heavy colorless gas that is formed by burning fuels |
| Comet | A small object made from dust and ice, like a dirty snow ball |
| Constellation | The position of stars in the sky: any of 88 groups of stars forming patterns |
| Core | The inner part of the Earth that is made of iron |
| Crater | A large, round hole in the ground made by an explosion or something falling from the sky |
| Crust | The thin outer layer of the Earth’s surface |
| Day | The time of light between one night and the next |
| Dwarf Planet | An object orbiting around the Sun that is large enough to be rounded by its own gravity, but not gravitationally dominant in its orbital area and is not a moon |
| Gas | A substance that has no fixed shape |
| Geyser | A natural pool of liquid that sometimes erupts, sending steam and hot liquid into the air; on Earth, this is caused by water |
| Iron | A very hard metal |
| Magnetic Field | An area that is magnetic, or has the power to attract and hold other objects |
| Mantle | The layer of super-hot rock that surrounds Earth’s core |
| Meteorologist | A person who studies the science that deals with atmosphere and weather |
| Mineral | A material found in nature that is not an animal or a plant |
| Moon | The natural heavenly body that shines by reflecting light from the sun and revolves around the earth |
| Mnemonic | Assisting or intended to assist memory; uses a pattern of letters, ideas, or associations |
| Night | The time between dusk and dawn where no sunlight can be seen |
| Organism | A living thing made up of one or more cells and able to carry on the activities of life |
| Oven | A chamber used for baking, heating, or drying |
| Phase | A part or step in a process: one part in a series of related events or actions; the shape of the part of the moon that is visible at different times during a month |
| Planet | Large, natural objects that orbit or travel around stars |
| Reflect | Occurs when a light ray hits a surface and bounces off |
| Refraction | The bending of a ray when it passes at an angle from one medium into another in which its speed is different (as when light passes from air into water) |
| Revolve | To move in a circular or curving course; to move around an object |
| Rocket | A flying device shaped like a tube that is driven by hot gases released from engines in its rear |
| Rotate | To turn or cause something to turn about an axis or a center |
| Shadow | The dark figure cast on a surface by a body that is between the surface and light |
| Solar | Using the sun’s rays specially to produce heat or electricity |
| Solar System | A star with the group of heavenly bodies that revolve around it; especially: the sun with the planets, moons, asteroids, and comets that orbit it |
| Space | The region beyond the Earth’s atmosphere |
| Star | Any of the heavenly bodies except planets which are visible at night and look like fixed points of light; giant spheres of superhot gas made mostly of hydrogen and helium |
| Storm | A serious disturbance of any element of nature |
| Sun | The star at the center of the solar system; a hot ball of gases that gives off energy |
| Sunrise | The apparent rising of the sun above the horizon |
| Sunset | The apparent sinking of the sun below the horizon |
| Volcano | A mountain that opens downward to molten rock below the surface |

Lesson 1: What are the objects in the sky?

|  |  |
| --- | --- |
| **Learning Target****Objective****Standard** | There are different types of objects in the sky that can be seen at different times.Students will be able to describe different objects in the sky. 1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, crayons, paper, flashcards of objects in the sky |
| **Books** | National Geographic Readers: Day and Night by Shira Evans |
| **Vocabulary** | Sun: The star at the center of the solar system; a hot ball of gases that gives off energyMoon: The natural heavenly body that shines by reflecting light from the sun and revolves around the earthStars: Any of the heavenly bodies except planets which are visible at night and look like fixed points of light; giant spheres of superhot gas made mostly of hydrogen and heliumPlanet: Large, natural objects that orbit or travel around stars |
| **Procedures** | **ENGAGE**Ask students: When you look up at the sky, what are some things you might see? What do you see during the day? What do you see at night? Give students time to brainstorm different ideas. As a class, make a tree map about the different objects they can see in the sky during the day and those that can be seen at night. Some ideas may include the sun, moon, stars, clouds, blue sky, black sky, and planets. Education: Day sky, night sky: <http://education.abc.net.au/res/i/L20/index.html>**EXPLORE**Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners. Students should divide a piece of paper in half. On one half, label “Daytime sky;” on the other half, label “Nighttime sky.” Have students draw at least 5 objects they can see during the day, and 5 objects they can see. Make sure the objects are labeled and check for understanding.**EXPLAIN**Book: National Geographic Readers: Day and Night by Shira EvansDifferent objects in the sky can be seen at different times, depending on whether the sun is on their side of the Earth or not. Use picture cards and have students discuss what they see. NASA Solar System: <https://solarsystem.nasa.gov/planets/overview/>As a class, create a KWL chart based on the stars, planets, and other objects in space. The KWL chart should be used throughout the unit. |
| **Enrichment** | **EXTEND**Ask the students to pick one of the items from the sky and draw a picture of it in their science notebook, along with a sentence describing the object.  |
| **Closure** | **ELABORATE**Discuss why certain items in the sky would be easier to see out in the country rather than in the city. Ask the students: Which item in the sky would be the easiest to see? Which would be the hardest? Why do you think that would be? |
| **Assessment** | **EVALUATE**Formative: Check for understanding with the different drawings the students have made, as well as the reflection in their science notebook. |

Differentiated Instruction

|  |  |  |
| --- | --- | --- |
| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the different objects in the sky that can be seen during the day and at night. Reinforce the differences between when each object can be seen and check for understanding.  | Discuss the different objects in the sky that can be seen during the day and at night. Ask the student: Which objects can be seen without a telescope? Why do you think others cannot be seen? | Discuss the different objects in the sky that can be seen during the day and at night. Ask the student: Can all objects in the sky be seen all the time? Why or why not? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different objects described in the lesson, and/or have the student draw the different planets and objects described in the lesson.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the planets and other items in the sky. Have student repeat the names until they have them memorized.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 3)** |
| Ask students: What do you notice about the objects that can be seen in the day and the objects that can be seen at night? How are they the same? How are they different? |
| **Interactive Technology** |
| App: “Solar Walk Lite: Planetarium 3D” – Planetary System EncyclopediaApp: “The Solar System by BabyBus” – BABYBUSGame: NASA Science: “The Solar System”: <https://spaceplace.nasa.gov/solar-system-explorer/en/#/review/solar-system-explorer/game.swf>Game: National Geographic Kids: “Planets Memory”: <https://kids.nationalgeographic.com/games/quick-play/planets-memory/> |

Lesson 2: What are the objects in the sky? (Solar System)

|  |  |
| --- | --- |
| **Learning Target****Objective****Standard** | There are different types of objects in the sky that can be seen using different methods.Students will be able to differentiate between planets, moons, and stars. 1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, BrainPOP jr. login, white boards, white board markers, pencils, science notebooks, crayons  |
| **Books** | Eight Great Planets! A Song About the Planets by Laura Purdie SalasPlanets by Martha E.H. Rustad |
| **Vocabulary** | Mnemonic: Assisting or intended to assist memory; uses a pattern of letters, ideas, or associationsOrbit: To move aroundMagnetic Field: An area that is magnetic, or has the power to attract and hold other objects |
| **Procedures** | **ENGAGE**Review the tree map made during the previous lesson. Ask the students: Are there some objects in the sky that can only be seen with a telescope? Do you think everything in space can be seen with a telescope? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss other objects in the sky that are farther away.Book: Eight Great Planets! A Song About the Planets by Laura Purdie Salas, or use the myON link: <https://www.myon.com/reader/index.html?a=ss_planets_s10>**EXPLORE**Video: BrainPOP jr.: “Solar System” (5:09): <https://jr.brainpop.com/science/space/solarsystem/>There are eight planets in our solar system, all which orbit around the sun. Orbiting is to move in a circle around something. To remember them we can use a mnemonic phrase – which is like a short poem or words to help memorize and remember things.My (Mercury)Very (Venus)Educated (Earth)Mother (Mars)Just (Jupiter)Served (Saturn)Us (Uranus)Nachos (Neptune)To demonstrate the orbit of the planets, have one student be the sun and stand in the middle. Have another student walk around the sun to represent a planet orbiting around the sun. The planets are also a great distance from each other. It can be difficult to picture how far the planets are from one another.Video: “Bill Nye The Science Guy on Outerspace (Full Clip)” (2:06): <https://www.youtube.com/watch?v=BdAqq-wEQV0>To demonstrate how far the planets are apart from each other, take the class outside (weather permitting.) Start off at the farthest part of the yard or playground. Tell the class they are starting at the sun. Walk 10 paces – MercuryWalk another 9 paces – VenusWalk another 7 paces – EarthWalk another 14 paces – MarsExplain to the class that these are called the inner planets. Between the fourth planet (Mars) and the fifth planet (Jupiter) there are thousands of asteroids in orbit of the sun called the Asteroid Belt. There may be no more room to walk to the next four planets, but the students could imagine how much further they would have to walk. From Mars:Walk another 95 paces – JupiterWalk another 112 paces – SaturnWalk another 249 paces – UranusWalk another 281 paces – NeptuneReturn to the classroom and have the students draw the planets in order. Make sure they are labeled. Students may also draw the orbits of the planets around the sun. Video: “Planets Song Video” (3:48): <https://www.youtube.com/watch?v=noiwY7kQ5NQ>Optional Video (while working): “The Solar System Song (with lyrics)” (4:21): <https://www.youtube.com/watch?v=F2prtmPEjOc>**EXPLAIN**Book: Planets by Martha E.H. Rustad, or use myON link: <https://www.myon.com/reader/index.html?a=sp_planets_s16>In our solar system, the planets all orbit around the sun. The stars also orbit around the sun. The sun has a magnetic field that attracts smaller objects and holds them in place. Besides planets, there are other objects in our solar system, such as stars, moons, asteroids, meteors, comets, and other satellites. |
| **Enrichment** | **EXTEND**Discuss how the planets are in a certain order. How do you think the planets further from the sun are different than the ones closest to the sun?  |
| **Closure** | **ELABORATE**Review the order of the planets. Ask the students to predict which of the planets would be warmer and which would be colder. Why do they think it would be that way? |
| **Assessment** | **EVALUATE**Formative: Check for understanding with students using the drawings in their science notebooks. |

Differentiated Instruction

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| --- | --- | --- |
| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Review the different planets in the solar system, including the mnemonic poem used to remember them. Show the student pictures of each planet and review the different names.  | Review the different planets in the solar system, including the mnemonic poem used to remember them. Ask the student: Do you think all the planets are like Earth? Why or why not? | Review the different planets in the solar system, including the mnemonic poem used to remember them. Review additional objects, such as dwarf planets, asteroids, and comets.  |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different planets described in the lesson, and/or have the student draw the different planets and objects described in the lesson.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the planets, including their characteristics. Have student repeat the names until they have them memorized.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 3)** |
| Ask students: What do you notice about the inner planets verses the outer planets? What do you think is the same? What is different?  |
| **Interactive Technology** |
| App: “Interactive Minds: Solar System – Lite” – Vosonos LLCApp: “Solar Walk 2 Ads+: Planetarium” – Solar System Encyclopedia 3DApp: “Space Images” – Jet Propulsion LaboratoryApp: “Solar System: All About Space” – Sasi Dharani KMGame: Kids Astronomy.com: “Make a Solar System”: <http://www.kidsastronomy.com/fun/make-a-solar-system.htm>Game: BrainPOP: “Build a Solar System”: <https://www.brainpop.com/games/buildasolarsystem/>Game: Turtle Diary: “Solar System Game”: <https://www.turtlediary.com/game/solar-system.html>Games: Interactive Sites for Education: “Solar System”: <http://interactivesites.weebly.com/solar-system.html> |

Lesson 3: What are the objects in the sky? (Mercury)

|  |  |
| --- | --- |
| **Learning Target****Objective****Standard** | There are characteristics of Mercury that distinguish it from other planets.Students will be able to describe Mercury as it differs from other planets.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, flour, salt, oil, water, rocks, cake pan, picture of Mercury from flashcards, measuring cups, measuring spoons, bowls, spoons, zippered sandwich bags |
| **Books** | Nearest to the Sun: The Planet Mercury by Nancy Loewen |
| **Vocabulary** | Rotate: To turn or cause something to turn about an axis or a centerRevolve/Orbit: To move in a circular or curving course; to move around an object |
| **Procedures** | **ENGAGE**Ask the students to repeat the mnemonic from the previous lesson: My Very Educated Mother Just Served Us Nachos. Ask the students: Which is the closest planet to the sun? What do you think it’s like there since it is so close to the sun? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think Mercury might be like, the temperature, what the days are like, and so on.Video: “Mercury/Planet Mercury/Planet Song for Kids” (2:17): <https://www.youtube.com/watch?v=buPuQ0eDYQM>**EXPLORE**Video: “The Planet Mercury: Astronomy and Space for Kids – FreeSchool” (3:24): <https://www.youtube.com/watch?v=NWUsfud9PzM&t=55s>Ask the students: How do you think the craters formed on Mercury? Give students a few minutes to brainstorm. Once they have come up with ideas, fill a cake pan with flour. From a few feet above, drop rocks into the flour. The rocks represent asteroids and other objects in space hitting the planet, and the indentations they make in the flour are the craters. Experiment with dropping different sized rocks from different heights.Students should return to their partners. Give each student 1 cup of flour, ¼ cup of salt, and a cup containing ¼ cup of warm water and 1 tsp. vegetable oil. Students should mix the flour and the salt together in a small bowl. Students should slowly pour the water into the flour mixture, stirring as they pour. They may need to add more water depending on how the mixture comes together. Once they have mixed everything together, they should have a homemade playdoh. Have the students form the playdoh into a sphere, using their fingers (or a rock) to make the craters. They can take their model of Mercury home, or they can be displayed for the class. Have students draw a picture of Mercury in their science notebooks, along with writing down a few interesting facts.**EXPLAIN**Video: “The Planet Mercury Song/Planet Songs for Children/Mercury Song for Kids/Silly School Songs” (3:07): <https://www.youtube.com/watch?v=tbejCiJBZxk>Mercury is the smallest planet in the solar system. It is also the fastest in the galaxy. It goes around the sun at 31 miles per second. People have known about Mercury for thousands of years: it was named after the Roman god Mercury, who was the fastest of all the gods. Mercury is the densest planet, with a core made of metal and a crust made of rock. Because Mercury doesn’t have an atmosphere, it doesn’t stay hot or cold for very long. It is also more vulnerable to being hit by comets and meteors, which is why it has so many craters. It can reach up to 800 degrees and get as cold as -800 degrees. It can be seen from Earth just as the sun rises in the morning. |
| **Enrichment** | **EXTEND**Book: Nearest to the Sun: The Planet Mercury by Nancy Loewen, or use the myON link: <https://www.myon.com/reader/index.html?a=as_mercu_s08>Mercury is the least explored inner planet. Ask the students: Do you think everything we know about Mercury is accurate? Why or why not?  |
| **Closure** | **ELABORATE**Exploring the planet Mercury has been difficult due to the extreme temperatures on the surface. The proximity of Mercury to the sun is responsible for how quickly it orbits the sun. While the orbit is very fast, Mercury’s rotation is slow, which is part of the reason its extreme temperatures last for such a long time. |
| **Assessment** | **EVALUATE**Formative: Check for understanding with students using the drawings in their science notebooks. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Review the different planets in the solar system, specifically the facts about Mercury. Check for understanding about the studied facts. | Review the different planets in the solar system, specifically the facts about Mercury. Ask the student: How are Mercury and the Earth the same? How are they different? | Review the different planets in the solar system, specifically the facts about Mercury. Ask the student: How would Mercury be different if it wasn’t so close to the sun? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of Mercury and the facts associated with the planet described in the lesson, and/or have the student draw a picture of Mercury to check for understanding.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore characteristics of Mercury. Have student repeat the names of all the planets until they have them memorized.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 1)** |
| Ask students: How would you describe Mercury to someone who has never seen it? What characteristics about it stand out in comparison to Earth?  |
| **Interactive Technology** |
| App: “My Solar System” – Alexander SkalovApp: “Solar System Journey – School Edition” – John Rouda |

Lesson 4: What are the objects in the sky? (Venus)

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| **Learning Target****Objective****Standard** | There are characteristics of Venus that distinguish it from other planets.Students will be able to describe Venus as it differs from other planets.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, flour, measuring cup, stick of butter (1/2 cup), microwave, picture of Venus |
| **Books** | Brightest in the Sky: The Planet Venus by Nancy Loewen |
| **Vocabulary** | Albedo: How reflective and bright something isGas: A substance that has no fixed shape |
| **Procedures** | **ENGAGE**Ask the students to repeat the mnemonic about the planets: My Very Educated Mother Just Served Us Nachos. Ask the students: Which is the second closest planet to the sun? What do you think it’s like there since it is so close to the sun? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think Venus might be like, the temperature, what the days are like, and so on.Video: “Planet Song for Kids/Solar System Song for Children/Venus Song for Kids” (2:00): <https://www.youtube.com/watch?v=w_AK_Fy0h7A>**EXPLORE**Video: “The Planet Venus: Astronomy and Space for Kids – FreeSchool” (3:37): <https://www.youtube.com/watch?v=UciCLg8g_4Y>Teacher’s note: If you are unable to melt the butter in the room, use two sticks: one melted, one solid.Ask the students: How do you think the rocks melted on Venus? Give students a few minutes to brainstorm. Once they have come up with ideas, fill a cake pan with flour. Show the students a stick of butter. Explain how the stick of butter is like one of the rocks on Venus. Ask the students: What do you think will happen to the stick of butter once it is heated?Melt the butter in a microwave (or use a stick that is already melted.) The flour is like the surface of Venus. Pour the butter over the top of the flour. It should form streams as it flows over the tops of the flour. Give the students a chance to watch as the butter turns hard again.Show the students a picture of Venus. In their science notebooks, have them draw a picture of Venus, along with a few interesting facts.**EXPLAIN**Video: “The Planet Venus Song/Planet Songs for Children/Venus Song for Kids/Silly School Songs” (2:46): <https://www.youtube.com/watch?v=QwAzyC5i7o0>It takes Venus 225 Earth days to go around the sun but takes it 243 days to rotate one time. The average temperature on Venus is 850 degrees Fahrenheit, making it the hottest planet in the solar system. It has a hard, rocky surface, with long rivers of molten lava and thousands of volcanoes. It also rotates backwards – most likely caused by a giant impact with a large asteroid or comet. The butter melting in the experiment represents the lava that flows on the planet, along with how it hardens.  |
| **Enrichment** | **EXTEND**Book: Brightest in the Sky: The Planet Venus by Nancy Loewen, or use the myON link: <https://www.myon.com/reader/index.html?a=as_venus_s08>Instead of the sun rising in the east and setting in the west, the sun on Venus appears to rise in the west and set in the east. Venus also has no moons. Ask the students: If you could survive on Venus, what would it be like? |
| **Closure** | **ELABORATE**Venus is one of the brightest planets in the solar system. Astronomers use the term albedo to describe how bright a planet is in absolute terms. When sunlight strikes a planet, some of the light is absorbed by the planet’s surface or atmosphere, and some is reflected. Albedo is a comparison between how much light strikes an object, and how much is reflected. Venus has the highest albedo of any major planet in the solar system. Venus is blanketed by highly reflective clouds. It is also considered to be Earth’s “twin,” or “sister planet,” because its size, mass, and gravity are very similar to Earth. |
| **Assessment** | **EVALUATE**Formative: Check for understanding with students using the drawings in their science notebooks. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Review the different planets in the solar system, specifically the facts about Venus. Check for understanding about the studied facts. | Review the different planets in the solar system, specifically the facts about Venus. Ask the student: How are Venus and the Earth the same? How are they different? | Review the different planets in the solar system, specifically the facts about Venus. Ask the student: How would Venus be different if it wasn’t so close to the sun? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of Venus and the facts associated with the planet described in the lesson, and/or have the student draw a picture of Venus to check for understanding.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore characteristics of Venus. Have student repeat the names of all the planets until they have them memorized.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 1)** |
| Ask students: How would you describe Venus to someone who has never seen it? What characteristics about it stand out in comparison to Earth?  |
| **Interactive Technology** |
| App: “Solar System – HD” – Magicbox Animation Private limitedVideo: “Ready-Jet-Go: Venus”: <http://pbskids.org/video/ready-jet-go/2365652720> |

Lesson 5: What are the objects in the sky? (Earth)

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| **Learning Target****Objective****Standard** | There are characteristics of Earth that distinguish it from other planets.Students will be able to describe Earth as it differs from other planets.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, BrainPOP jr. login, crayons, dental floss, sandwich bags, food coloring (red, green, orange, brown, yellow, blue), flour, salt, cream of tartar, vegetable oil, water, large pot, stove(optional: store-bought playdoh: red, green, orange, brown, yellow, blue) |
| **Books** | Soil, Silt, and Sand: Layers of the Underground by Jody Sullivan RakeEarth by Martha E.H. Rustad |
| **Vocabulary** | Revolve/Orbit: To move in a circular or curving courseCore: The inner part of the Earth that is made of ironMantle: The layer of super-hot rock that surrounds Earth’s coreCrust: The thin outer layer of Earth’s surfaceAtmosphere: The layer of gas that surrounds EarthMineral: A material found in nature that is not an animal or a plantIron: A very hard metalMagnetic field: An area that is magnetic, or has the power to attract and hold other objects |
| **Procedures** | **ENGAGE**Ask the students to repeat the mnemonic about the planets: My Very Educated Mother Just Served Us Nachos. Ask the students: Which is the third closest planet to the sun? The Earth is sometimes called the Goldilocks planet – why do you think that is? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they know about the Earth.Video: “Earth Facts For Kids/Earth Songs For Kids” (2:24): <https://www.youtube.com/watch?v=gKdxPw9HDUs>**EXPLORE**Video: “Outer Space: ‘A Beautiful, Beautiful World,’ The Earth Song by StoryBots” (1:56): <https://www.youtube.com/watch?v=TBmZjOHrVJ0>Book: Soil, Silt, and Sand: Layers of the Underground by Jody Sullivan Rake, or use myON link: <https://www.myon.com/reader/index.html?a=us_sss_f15> (pgs. 18-19)The Earth has many different layers. Explain that each of the colors of playdoh will represent a different layer of the Earth.Red represents the solid inner core, which is almost as hot as the sunOrange represents the liquid outer core that spins and creates the Earth’s magnetic fieldYellow represents the mantle, which is the thickest layer made of very hot rocksBrown represents the Earth’s crust made of rocksBlue represents the oceanGreen represents the continents (the land we walk on)Teacher’s note: Playdoh can be made or bought for this activityPlaydough to Plato: Layers of the Earth: <https://www.playdoughtoplato.com/layers-of-the-earth/>Homemade playdoh: 3 cups of flour, ½ cup of salt, 6 tbsp. cream of tartar, 3 tbsp. vegetable oil, 3 cups of waterMix all ingredients into a pot until all the lumps are gone. Move the pot to the stove and cook over low heat, stirring often. The dough should start to thicken in a few minutes. Turn off the heat once the mixture starts pulling away from the sides. Give the dough a few minutes to cool off so it can be kneaded and dyed. Divide the cooked playdough into six parts: two small (golf ball sized), two medium, and two large balls. Drop several drops of food coloring into each ball. The two small balls should be red and green; the medium balls should be orange and brown; and the large ones should be yellow and blue.Optional: Divide the store-bought playdoh into similar sections: the two small balls should be red and green; the medium balls should be orange and brown; and the large ones should be yellow and blue.Students should reunite with their partners from the discussion to complete the model of the Earth. As they build their model, explain the different layers. They should each receive the different sized balls of playdoh. Students should start by rolling the small red dough into a ball. Flatten the medium sized orange dough and place it around the red ball, pinching the sides closed and removing any extra dough in the process. Flatten the yellow ball and wrap it around the orange ball. Then, flatten the brown ball and place it over the yellow ball. Finally, flatten the blue ball and cover the model. Use the green ball to form the continents.Teacher’s note: The continents can be formed beforehand.Using dental floss, have the students cut the planet in half. Teacher assistance may be necessary. Have students draw and color a picture of the model in their science notebooks and label each of the layers.**EXPLAIN**Video: BrainPOP jr.: “Earth” (3:56): <https://jr.brainpop.com/science/space/earth/>Video: “The Planet Earth Song/Planet Songs for Children/Earth Song for Kids/Silly School Songs” (2:46): <https://www.youtube.com/watch?v=yz7-TADryM0>The Earth is called the “Goldilocks Planet” because it is not too hot, and not too cold – unlike the other planets in the solar system. It is the only planet that has an atmosphere that has oxygen, has liquid water, and has life in our solar system. It takes the Earth one year to orbit the sun, and 24 hours (one day) to rotate on its axis.  |
| **Enrichment** | **EXTEND**Book: Earth by Martha E.H. Rustad, or use the myON link: <https://www.myon.com/reader/index.html?a=sp_earth_s16>Ask the students: How do you think the layers of the Earth affect life? Do you think they are related? Discuss the idea of a magnetic field from the iron within the Earth keeping the atmosphere in place. |
| **Closure** | **ELABORATE**The Earth differs from all the other planets because it has such a wide diversity of life. This has only been possible because of the Earth’s atmosphere, which has protected the Earth. The atmosphere is the perfect blend of gases for life to occur, held close to the Earth by the magnetic field from the Earth’s core. |
| **Assessment** | **EVALUATE**Formative: Check for understanding with students using the model and the drawings in their science notebooks. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Review the different planets in the solar system, specifically the facts about Earth. Check for understanding about the studied facts. | Review the different planets in the solar system, specifically the facts about Earth. Ask the student: Why is the Earth the only planet in the solar system which has life on it?  | Review the different planets in the solar system, specifically the facts about Earth. Ask the student: How would Earth be different if it wasn’t so close to the sun? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of Earth and the facts associated with the planet described in the lesson, and/or have the student draw a picture of Earth to check for understanding.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore characteristics of Earth. Have student repeat the names of all the planets until they have them memorized.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 2)** |
| Ask students: How would you apply what you learned to develop the possibility of life on other planets? What would different planets need that the Earth already must sustain life?  |
| **Interactive Technology** |
| App: “Earth 3D” – SOLILABApp: “3D Earth – weather forecast” – widget, rain alerts & mapsApp: “MeteoEarth” – MeteoGroph Deutschland GmbHGame: Science Games for Kids: “Earth, Sun & Moon”: <http://www.sciencekids.co.nz/gamesactivities/earthsunmoon.html> |

Lesson 6: What are the objects in the sky? (Mars)

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| **Learning Target****Objective****Standard** | There are characteristics of Mars that distinguish it from other planets.Students will be able to describe Mars as it differs from other planets.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, BrainPOP jr. login, baking soda, salt, dishwashing liquid, red food coloring, vinegar, scissors, party hats, small plastic bottles, funnels, paper plates, newspaper, measuring spoons, cups, spoons, picture of Mars |
| **Books** | The Secrets of Mars by Kassandra Radomski |
| **Vocabulary** | Volcano: A mountain that opens downward to molten rock below the surface |
| **Procedures** | **ENGAGE**Ask the students to repeat the mnemonic about the planets: My Very Educated Mother Just Served Us Nachos. Ask the students: Which is the fourth closest planet to the sun? What do you think it’s like there since it is so close to the sun? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think Mars might be like, the temperature, what the days are like, and so on.Video: “Mars Song/Planet Mars Song for Kids/Mars Song for Kids” (2:05): <https://www.youtube.com/watch?v=ZfBpbRULkOA>**EXPLORE**Video: “All About Mars: Astronomy and Space for Kids – FreeSchool” (5:22): <https://www.youtube.com/watch?v=gr7ShbG231U>One of the biggest features on Mars is a volcano called Olympus Mons. It is the largest mountain in the solar system at more than 25 kilometers high. It is so big that astronomers could see it through telescopes almost 200 years ago. The students and their partners will be making their own volcanoes and watching them erupt. PBSparents: Crafts for Kids: DIY Volcano: <http://www.pbs.org/parents/crafts-for-kids/diy-volcano/>Give each pair of students: one birthday party hat, 2 tablespoons of baking soda, ½ teaspoon of salt, scissors, and a small glass jar.The students should cut the tip off the birthday party hat. Cut zig-zags in the top with scissors (optional.) The hats can be decorated with drawings of rocks to match the surface of Mars. In the plastic water bottle (which should be the same height as the hat,) add the baking soda, salt, and food coloring using a funnel. Mix well. The teacher should then add about a squirt or two to the top of the mix. Place some newspaper down on the table or desk, and a paper plate on top of the paper. Place the bottle on top of the paper plate. Put the party hat on top of the bottle. Once the students are ready, the teacher can add enough vinegar to cause the eruption. Have students draw a picture of Mars in their science notebook. Students should also write at least three facts about the planet.**EXPLAIN**Video: BrainPOP jr.: “Mars” (4:06): <https://jr.brainpop.com/science/space/mars/>Video: “The Planet Mars Song/Planet Songs for Children/Mars Song for Kids/Silly School Songs” (2:50): <https://www.youtube.com/watch?v=2bWQu9a-f7Q>Volcanoes allow hot lava and gases to escape below the surface. To make the simulated volcano erupt, when vinegar is added to baking soda, it creates carbon dioxide gas. The gas leaves the solution as bubbles, causing the volcanic eruption.Mars is the most studied planet in all the solar system, mostly because it is close to us, and has a surface that can be explored by robots. The surface of Mars is red, covered with red dirt and rocks everywhere. Mars has higher mountains and deeper canyons than any other planet. It takes 687 days for Mars to orbit the sun, but only a little over 24 hours to rotate once. It can get up to about 98 degrees and go as low as -190 degrees Fahrenheit. Video: “Should We Go to Mars?” (4:42): <https://www.youtube.com/watch?v=vphJ6WyuxGk> |
| **Enrichment** | **EXTEND**Book: Smithsonian: The Secrets of Mars by Kassandra Radomski, or use the myON link: <https://www.myon.com/reader/index.html?a=pl_mars_f15>A few different robots have been sent up to Mars to explore the planet’s surface. One of them is called the Curiosity, which landed in 2012. Pictures and images have been sent back to Earth as the rover explores Mars.Video: “Curiosity Has Landed” (2:30): <https://www.youtube.com/watch?v=N9hXqzkH7YA>Ask the students: If you were running the Curiosity, what would you want it to look for? What would you want to see? |
| **Closure** | **ELABORATE**Just like the Earth, Mars has both North and South polar ice caps. Both ice caps are made mostly of frozen water. Scientists think life could have once existed on Mars. Mars has seasons like Earth does too, although they are much longer than Earth seasons because Mars is further from the sun. Mars doesn’t have a protective atmosphere like the Earth, so it cannot store heat from the sun. Also, the dust storms on Mars are larger than any other planet in the solar system. Mars has two moons called Phobos and Deimos.  |
| **Assessment** | **EVALUATE**Formative: Check for understanding with students using the drawings in their science notebooks. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Review the different planets in the solar system, specifically the facts about Mars. Check for understanding about the studied facts. | Review the different planets in the solar system, specifically the facts about Mars. Ask the student: How are Mars and the Earth the same? How are they different? | Review the different planets in the solar system, specifically the facts about Mars. Ask the student: How would Mars be different if it wasn’t so far from the sun? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of Mars and the facts associated with the planet described in the lesson, and/or have the student draw a picture of Mars to check for understanding.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore characteristics of Mars. Have student repeat the names of all the planets until they have them memorized.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 1)** |
| Ask students: How would you describe Mars to someone who has never seen it? What characteristics about it stand out in comparison to Earth?  |
| **Interactive Technology** |
| App: “Mars Globe” – Midnight MartianApp: “Midnight Planes” – Midnight MartianApp: “Mars Walk” – Lockheed MartinWebsite: NASA Mars Exploration: <https://mars.nasa.gov/participate/funzone/>Game: “Backyardigans Mission to Mars”: <http://www.gamesxl.com/animal/backyardigans-mission-to-mars> |

Lesson 7: What are the objects in the sky? (Jupiter)

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| **Learning Target****Objective****Standard** | There are characteristics of Jupiter that distinguish it from other planets.Students will be able to describe Jupiter as it differs from other planets.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, picture of Jupiter (flash card,) whole milk, food coloring (orange, red, yellow,) dish soap (Dawn,) paper plate or bowl, cotton swabs |
| **Books** | The Largest Planet: Jupiter by Nancy Loewen |
| **Vocabulary** | Storm: A serious disturbance of any element of nature  |
| **Procedures** | **ENGAGE**Ask the students to repeat the mnemonic about the planets: My Very Educated Mother Just Served Us Nachos. Ask the students: Which is the fifth closest planet to the sun? What do you think it’s like there since it is further away from the sun? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think Jupiter might be like: the temperature, what the days are like, and so on.Video: “Jupiter/Jupiter Song for Kids/Planet Songs for Kids/Solar System Songs for Children” (2:30): <https://www.youtube.com/watch?v=zMCDl1Asm_c>**EXPLORE**Video: “All About Jupiter for Children: Astronomy and Space for Kids – FreeSchool” (5:10): <https://www.youtube.com/watch?v=hz_fc69LdjY>One of the biggest features on Jupiter is called Jupiter’s Great Red Spot. The red spot is a storm that has been continuously going on for over 400 years. Winds inside of this storm reach speeds of 270 miles per hour. The spot is also at least three times the size of Earth. Video “Why with Nye (Ep. 4): Bill Nye and Jupiter’s Super Storm” (1:53): <https://www.youtube.com/watch?v=GdJlpvwpH6Q>Steve Spangler Science: Color Changing Milk: <https://www.stevespanglerscience.com/lab/experiments/milk-color-explosion/>Give each pair of students: a small plate (or bowl,) cup of whole or 2% milk, food coloring, cotton swabs, and dishwashing soap (Dawn.) Teacher’s note: Measure the milk and dishwashing soap before the experiment and put them in separate cups for easy use. Students should pour the milk into the plate, completely covering the bottom to a depth of about ¼ inch. Allow the milk to settle before moving on to the next step. Add two drops of each of the food coloring - red, yellow, and orange – to the milk. Keep the drops close together in the center of the plate of milk. Ask the students what they think will happen if they touch the cotton swab to the center of the milk. Have them carefully touch the swab without stirring the milk. Dip the cotton swab into the cup of dishwashing soap. Place the soapy end of the cotton swab in the middle of the milk and hold it there for 10 to 15 seconds. The result should look like the storm on Jupiter. Have students draw a picture of Jupiter in their science notebook. Students should also write at least three facts about the planet.Video: “Amazing milk trick – ‘The Jupiter effect’ – HD” (2:02): <https://www.youtube.com/watch?v=kAQamrSy0Nw>**EXPLAIN**Book: The Largest Planet: Jupiter by Nancy Loewen, or use the myON link: <https://www.myon.com/reader/index.html?a=as_jupit_s08>Video: “The Planet Jupiter Song/Planet Songs for Children/Jupiter Song for Kids/Silly School Songs” (2:56): <https://www.youtube.com/watch?v=Ik_OAH3cL0o>Milk is mostly water, but it also contains vitamins, minerals, proteins, and tiny droplets of fat suspended in the solution. Milk fat is a non-polar molecule which doesn’t dissolve in water. When soap is mixed in, the soap collects the fat molecules from the milk, moving the food coloring molecules around.Jupiter’s atmosphere is made up of hot gases that are constantly moving. On Earth, as cooler gas moves down through the atmosphere, the swirling intensifies, but there is no solid ground on Jupiter to slow it down. When the swirling gases merge into one another, they create giant circling storms. Astronomers believe that several giant storms came together and formed the Great Red Spot. The Great Red Spot keeps going by drawing hot gases from above, and cooler gases from below. This keeps the storm in motion.Video: “Why with Nye (Ep 8): Bill Nye Explains How Jupiter is Like a Blender” (2:57): <https://www.youtube.com/watch?v=mkZPuJySQ5U> |
| **Enrichment** | **EXTEND**The space craft Juno was launched on August 5, 2011 to improve the understanding of the solar system’s beginnings by revealing the origin and evolution of Jupiter. The goal was to determine how much water is in Jupiter’s atmosphere, map the gravity fields, and so on. NASA: Juno: <https://www.nasa.gov/mission_pages/juno/main/index.html>Using the website, explore the picture of Juno, including the different pictures, videos, and sounds recorded by Juno. |
| **Closure** | **ELABORATE**Jupiter is the largest object in our solar system besides the sun. It has a mass of more than 300 times the mass of Earth, and is named after the Roman god Jupiter, known to the Greeks as Zeus. Jupiter rotates every 9 hours and 55 minutes. However, it takes about 4,332 days for Jupiter to orbit around the sun. The average temperature is -244 degrees Fahrenheit. Jupiter also has 62 moons, four of which can be seen at night with a pair of binoculars.  |
| **Assessment** | **EVALUATE**Formative: Check for understanding with students using the drawings in their science notebooks. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Review the different planets in the solar system, specifically the facts about Jupiter. Check for understanding about the studied facts. | Review the different planets in the solar system, specifically the facts about Jupiter. Ask the student: How are Jupiter and the Earth the same? How are they different? | Review the different planets in the solar system, specifically the facts about Jupiter. Ask the student: How would Jupiter be different if it wasn’t so far from the sun? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of Jupiter and the facts associated with the planet described in the lesson, and/or have the student draw a picture of Jupiter to check for understanding.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore characteristics of Jupiter. Have student repeat the names of all the planets until they have them memorized.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 1)** |
| Ask students: How would you describe Jupiter to someone who has never seen it? What characteristics about it stand out in comparison to Earth?  |
| **Interactive Technology** |
| App: “Jupiter Moon Tracker” – James LiApp: “Jupiter Simulator” – Yeudy BlancoVideo: PBS Kids: Ready Jet Go: “Jupiter”: <http://pbskids.org/video/ready-jet-go/2365825226>Game: NASA Space Place: “JunoQuest”: <https://spaceplace.nasa.gov/junoquest/en/#/review/junoquest/JunoGame.swf> |

Lesson 8: What are the objects in the sky? (Saturn)

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| **Learning Target****Objective****Standard** | There are characteristics of Saturn that distinguish it from other planets.Students will be able to describe Saturn as it differs from other planets.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, picture of Saturn (flash card,) warm or hot water, pitcher, Alka-Seltzer tablets, glass jar, small plastic water bottles with sports cap lids, funnel |
| **Books** | Ringed Giant: The Planet Saturn by Nancy Loewen |
| **Vocabulary** | Rocket: A flying device shaped like a tube that is driven by hot gases released from engines in its rearCarbon dioxide: A heavy colorless gas that is formed by burning fuels |
| **Procedures** | **ENGAGE**Ask the students to repeat the mnemonic about the planets: My Very Educated Mother Just Served Us Nachos. Ask the students: Which is the sixth closest planet to the sun? What do you think it’s like on Saturn since it is further away from the sun? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think Saturn might be like: the temperature, what the days are like, and so on.Video: “Saturn/Saturn Song for Kids/Planet Songs for Kids” (1:53): <https://www.youtube.com/watch?v=LJktwIxAW2I>**EXPLORE**Video: “All About Saturn for Children: Astronomy and Space for Kids – FreeSchool” (6:37): <https://www.youtube.com/watch?v=KjZf88aBGe8>Saturn is Jupiter’s twin – both gaseous planets have hydrogen and helium, with over 60 moons. In 1997, an unmanned spacecraft called Cassini was launched to explore Saturn. It was taller than a 2-story building and needed the help of a powerful rocket to lift it off the ground into outer space. To see how chemical reactions can launch a rocket, the students can make their own bottle rockets. ExpeRimental: “Fizzy bottle rockets”: <http://www.rigb.org/docs/fizzybottlerockets_infosheet_v2_0.pdf>Teacher’s note: This experiment should be done outdoors. Give each pair of students: a small plastic water bottle with a push/pull cap, two Alka-Seltzer tablets, a funnel, and access to warm water from a pitcher. Show the students what happens when an Alka-Seltzer tablet is dropped into a glass of cold water. Explain that the bubbles are made because the tablet and water react to make carbon dioxide gas. Repeat this with a glass of much warmer water – they should see a difference in the way the tablet reacts with the warm water.Students should unscrew the lid of the bottle and make sure the pop-up lid is firmly pressed down. Break two tablets in half and drop all the pieces into the bottle. Quickly screw the lid back on firmly, give the bottle a quick shake, and place upside down in a mug or glass jar. Stand back and wait. Allow at least three minutes to pass before checking the rocket. If it has not launched, use slightly warmer water. Video: “Science for kids – How to make fizzy bottle rockets – ExpeRimental #16” (4:43): <https://www.youtube.com/watch?v=z4645B03AC4>Have students draw a picture of Saturn in their science notebook. Students should also write at least three facts about the planet.**EXPLAIN**Book: Ringed Giant: The Planet Saturn by Nancy Loewen, or use the myON link: <https://www.myon.com/reader/index.html?a=as_satur_s08>Video: “Explore Saturn’s Rings” (3:38): <https://www.youtube.com/watch?v=BxY8v4lNltM&t=25s>Alka-Seltzer tablets contain a chemical which reacts with water to produce carbon dioxide gas. This gas builds up inside the bottle until the pressure is enough to pop the lid. When the lid pops, it pushes down on the bottom of the glass, which results in an upwards push on the bottle. Once in the air, the liquid coming out of the bottle pushes it along in the same way as the gases coming out of a real rocket to propel it upwards.Saturn is most well-known for its rings. Its rings are 169,800 miles wide, although the rings are only about half a mile thick. There are 7 rings in total, made up of particles of ice, dust, and rocks. The rings are held in place by the moons that orbit the planet. The gravity of these moons also causes the gaps that are seen between the rings.Video: “The Planet Saturn Song/Planet Songs for Children/Saturn Song for Kids/Silly School Songs” (2:34): <https://www.youtube.com/watch?v=bZzbJJN6exI> |
| **Enrichment** | **EXTEND**The space craft Cassini was launched from Cape Canaveral on October 15, 1997. After observing other planets, it arrived near Saturn in 2004. Cassini collected enormous amounts of data about Saturn: the planet itself, its magnetosphere, rings, and moons. NASA: Cassini: <https://saturn.jpl.nasa.gov/>Using the website, explore the picture of Cassini, including the different pictures, videos, and sounds recorded by Cassini. |
| **Closure** | **ELABORATE**Saturn is the second largest planet in the solar system and is a gas giant like Jupiter. Saturn is the least dense planet in the Solar System, made up mostly of hydrogen and helium. It is believed Saturn would be able to float in water because it is so lightweight. Because it is so lightweight and spins so fast, Saturn is not perfectly round. It is wider in the middle and narrower near its top and bottom. Saturn takes only 10 hours to rotate one time, and about 10,759 days to orbit the sun. Its average temperature is -300 degrees Fahrenheit. |
| **Assessment** | **EVALUATE**Formative: Check for understanding with students using the drawings in their science notebooks. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Review the different planets in the solar system, specifically the facts about Saturn. Check for understanding about the studied facts. | Review the different planets in the solar system, specifically the facts about Saturn. Ask the student: How are Saturn and the Earth the same? How are they different? | Review the different planets in the solar system, specifically the facts about Saturn. Ask the student: How would Saturn be different if it wasn’t so far from the sun? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of Saturn and the facts associated with the planet described in the lesson, and/or have the student draw a picture of Saturn to check for understanding.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore characteristics of Saturn. Have student repeat the names of all the planets until they have them memorized.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 1)** |
| Ask students: How would you describe Saturn to someone who has never seen it? What characteristics about it stand out in comparison to Earth?  |
| **Interactive Technology** |
| App: “Cassini-Huygens Mission to Saturn” – University of Colorado BoulderApp: “Voyager: Grand Tour” – Rumor Games, LLCApp: “Gas Giants” – Software BisqueVideo: PBS Kids: Ready Jet Go: “Saturn”: <http://pbskids.org/video/ready-jet-go/2365724916> |

Lesson 9: What are the objects in the sky? (Uranus)

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| **Learning Target****Objective****Standard** | There are characteristics of Uranus that distinguish it from other planets.Students will be able to describe Uranus as it differs from other planets.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, picture of Uranus (flash card,) glass jars with lids, hot water, ice, hairspray |
| **Books** | The Sideways Planet: Uranus by Nancy Loewen  |
| **Vocabulary** | Magnetic field: An area that is magnetic, or has the power to attract and hold other objectsAtmosphere: The layer of gas held close to a planet by gravity |
| **Procedures** | **ENGAGE**Ask the students to repeat the mnemonic about the planets: My Very Educated Mother Just Served Us Nachos. Ask the students: Which is the seventh closest planet to the sun? What do you think it’s like on Uranus since it is very far away from the sun? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think Uranus might be like: the temperature, what the days are like, and so on.Video: “Planet Song for Kids/Solar System Song for Children/Uranus Song for Children” (2:01): <https://www.youtube.com/watch?v=TQiDAlyAmMQ>**EXPLORE**Video: “All About Uranus for Kids: Astronomy and Space for Children – FreeSchool” (5:15): <https://www.youtube.com/watch?v=63KonRAL6CA>Uranus is one of the “gas giants,” the four outer planets which are entirely composed of gas: Jupiter, Saturn, Uranus, and Neptune. The atmosphere of Uranus is the coldest in the solar system. In the atmosphere are layers of different types of clouds. While the clouds on Earth are different than the clouds on Uranus, we can still do a simulation of clouds.Gift of Curiosity: “Weather science: How to make a cloud in a jar”: <https://www.giftofcuriosity.com/weather-science-how-to-make-a-cloud-in-a-jar/>Give each pair of students: a glass jar with a lid, hairspray, and ice.The teacher will pour about 1/3 cup of hot water into each jar. Have the students swirl the water around a bit to warm up the sides of the jar. Turn the lid upside down and place it on top of the jar. Place several ice cubes onto the lid and allow it to rest on top of the jar for about 20 seconds. Remove the lid, and quickly spray a bit of hairspray into the jar, and then replace the lid with the ice still on top. Watch the cloud form. When they see a good amount of condensation form, remove the lid and watch the “cloud” escape into the air. Have students draw a picture of Uranus in their science notebook. Students should also write at least three facts about the planet.**EXPLAIN**Book: The Sideways Planet: Uranus by Nancy Loewen, or use the myON link: <https://www.myon.com/reader/index.html?a=as_uranu_s08>When warm water is added to the jar, some of it turns into water vapor. The water vapor rises to the top of the jar where it meets the air cooled by the ice cubes. Water vapor condenses when it cools down. However, a cloud can only form in the water vapor has something to condense on to. In nature, water vapor may condense onto dust particles, air pollution, pollen, etc. In the jar, the water vapor condensed onto the hairspray. Uranus is the only planet that orbits the sun lying on its side. Because Uranus is lying on its side as it orbits the sun, for nearly a quarter of its orbit, one pole of the planet is in complete darkness. Scientists aren’t sure why Uranus is on its side. One theory is that a very large object smashed into the planet, which changed the direction of the rotation. Another theory is that the tilt of the axis may have been caused by a large moon that was slowly pulled away from the planet by another large planet when the Solar System was still new. The gravitational pull may have caused it to tilt on its side.Uranus has rings, though they don’t stretch out as far as the rings of Saturn. They are made of black dust particles and large rocks. Uranus has 27 moons. Uranus rotates once every 17.2 hours but takes 30,684 days (84.3 years) to orbit around the sun. The average temperature is -300 degrees Fahrenheit. Video: “The Planet Uranus Song/Planet Songs for Children/Uranus Song for Kids/Silly School Songs” (2:20): <https://www.youtube.com/watch?v=GXrYyXHtWtk> |
| **Enrichment** | **EXTEND**The space craft Voyager 2 was launched in 1977. It targeted the outer planets: Jupiter, Saturn, Uranus, and Neptune. Voyager 2 remains the only spacecraft to have flown by Uranus, which happened in 1986. The planet displayed little detail but gave evidence of an ocean of boiling water about 800 km below the cloud tops. It also discovered 10 new moons, two new rings, and a magnetic field stronger than that of Saturn. NASA: Missions: Voyager 2: <https://solarsystem.nasa.gov/missions/voyager-2/in-depth/> |
| **Closure** | **ELABORATE**Uranus is an extremely cold planet and has been called the ice giant. It is believed that Uranus is made up of rock and ice, and has a large, rocky core. There also may be a huge ocean on the surface, but the temperature may be extremely hot, even up to 5000 degrees Fahrenheit. Uranus was first seen by William Herschel in 1781 using a telescope. Uranus is the smallest of the four “giants,” but is still several times larger than the Earth.  |
| **Assessment** | **EVALUATE**Formative: Check for understanding with students using the drawings in their science notebooks. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Review the different planets in the solar system, specifically the facts about Uranus. Check for understanding about the studied facts. | Review the different planets in the solar system, specifically the facts about Uranus. Ask the student: How are Uranus and the Earth the same? How are they different? | Review the different planets in the solar system, specifically the facts about Uranus. Ask the student: How would Uranus be different if it wasn’t so far from the sun? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of Uranus and the facts associated with the planet described in the lesson, and/or have the student draw a picture of the planet Uranus to check for understanding.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore characteristics of the planet Uranus. Have student repeat the names of all the planets until they have them memorized.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 1)** |
| Ask students: How would you describe the planet Uranus to someone who has never seen it? What characteristics about it stand out in comparison to Earth?  |
| **Interactive Technology** |
| App: “Find Pluto – and Other Planes” – Paul YoungApp: “Size the Solar System” – Justin HughesGame: “Planet Uranus, interactive fun game”: <https://www.math4childrenplus.com/uranus/> |

Lesson 10: What are the objects in the sky? (Neptune)

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| **Learning Target****Objective****Standard** | There are characteristics of Neptune that distinguish it from other planets.Students will be able to describe Neptune as it differs from other planets.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, picture of Neptune (flash card,) very warm tap water, liquid soap, cups, water bottles, Alka-Seltzer tablets, large tubs, funnel |
| **Books** | Farthest from the Sun: The Planet Neptune by Nancy Loewen |
| **Vocabulary** | Geyser: A natural pool of liquid that sometimes erupts, sending steam and hot liquid into the air; on Earth, this is caused by water |
| **Procedures** | **ENGAGE**Ask the students to repeat the mnemonic about the planets: My Very Educated Mother Just Served Us Nachos. Ask the students: Which is the eighth planet from the sun? What do you think it’s like on Neptune since it is very far away from the sun? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think Neptune might be like: the temperature, what the days are like, and so on.Video: “Planet Song for Kids/Solar System Song for Children/Neptune Song for Children” (1:39): <https://www.youtube.com/watch?v=EHBimKW-CMc>**EXPLORE**Video: “All About Neptune for Kids: Astronomy and Space for Children – FreeSchool” (5:36): <https://www.youtube.com/watch?v=VM22MyLaRSs>Neptune is one of the “gas giants,” the four outer planets which are entirely composed of gas: Jupiter, Saturn, Uranus, and Neptune. Neptune is also the fourth largest plan in the solar system. Even though Neptune is large, it cannot be seen without a powerful telescope. Neptune’s largest moon is known as Triton, which is the seventh largest moon in the Solar System. Triton has an icy surface with geysers and craters. An eruption of a Triton geyser may last up to a year. ScienceNetLinks: Geyser Riser: <http://sciencenetlinks.com/media/filer/2011/09/27/tf-snl-geyser-riser.pdf>Each pair of students will need: very warm tap water, liquid soap (in a cup,) small bottle with a narrow neck (water bottle,) and Alka-Seltzer tablets (broken into pieces.) Note: this experiment should be done over a large tub or outside (weather permitting.)Fill the water bottle almost to the top with very warm tap water with a funnel. Add a few drops of liquid soap. Set the bottle in a large tub, or outside on the ground. Drop a broken-up Alka-Seltzer tablet into the bottle. Immediately put your palm firmly over the top. Ask students if they feel the pressure build-up. What do they hear? Students should then lift their hand and listen again. Do you hear a pop sound as the gas rushes out? What makes the soap jet out like that? To do the experiment again, add more soap and another Alka-Seltzer tablet.Have students draw a picture of Neptune in their science notebook. Students should also write at least three facts about the planet.**EXPLAIN**Book: Farthest from the Sun: The Planet Neptune by Nancy Loewen, or use the myON link: <https://www.myon.com/reader/index.html?a=as_neptun_s08>Gas expands, especially when it’s hot. If you squeeze a balloon that’s half full, it pushes back. It is the air inside pushing out against the balloon walls. Like a balloon, geysers fill with gas, but the walls don’t stretch. So, the pressure inside gets harder and harder until the gas shoots out the top, taking underground water with it. On Earth, the eruption is water; while on Triton, the eruption is most likely liquid nitrogen or methane. Not much was known about Neptune until it was visited by the same spacecraft that visited Uranus: Voyager 2, in 1989. There is a large white cloud that moves around Neptune’s atmosphere. Neptune is a very windy place. No other planet in the solar system has winds that are as strong as Neptune’s. Neptune also has six rings, which scientists believe are new, and more irregular than the rings of other planets. Neptune’s orbit is offset from the sun. At times, it takes it further from the sun than any other planet. Neptune takes 60,190 days to make one orbit around the sun, or about 165 years. However, it only takes about 16 hours for Neptune to rotate once. The average temperature is -370 degrees Fahrenheit. Video: “The Planet Neptune Song/Planet Songs for Children/Neptune Song for Kids/Silly School Songs” (3:09): <https://www.youtube.com/watch?v=5JfAQ5cvrW8> |
| **Enrichment** | **EXTEND**The space craft Voyager 2 was launched in 1977. It targeted the outer planets: Jupiter, Saturn, Uranus, and Neptune. Voyager 2 remains the only spacecraft to have flown by Neptune, which happened in 1989. Neptune has 13 moons in total. Triton is its most unusual moon, since it orbits Neptune in the opposite direction of Neptune’s own rotation on its axis. All the other major moons in the Solar System follow their planets round as they turn. Space TV: Planet Neptune: <https://www.spacetv.net/neptune/> |
| **Closure** | **ELABORATE**Neptune was discovered in 1846 by Johann Galle and Heinrich D’Arrest. The blue color of Neptune comes from the methane in the atmosphere. It also has a dark spot from a storm, like the one on Jupiter. Neptune has been the furthest planet from the sun as of 2006 instead of Pluto: a full-fledged planet is defined as an object that orbits the sun and is large enough to have become round due to the force of its own gravity. It also must dominate the area around its orbit. Pluto was “demoted” because it does not dominate the area around its orbit. Charon, its large “moon,” is only about half the size of Pluto, while other true planets are far larger than their moons.  |
| **Assessment** | **EVALUATE**Formative: Check for understanding with students using the drawings in their science notebooks. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Review the different planets in the solar system, specifically the facts about Neptune. Check for understanding about the studied facts. | Review the different planets in the solar system, specifically the facts about Neptune. Ask the student: How are Neptune and the Earth the same? How are they different? | Review the different planets in the solar system, specifically the facts about Uranus. Ask the student: How would Neptune be different if it wasn’t so far from the sun? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of Neptune and the facts associated with the planet described in the lesson, and/or have the student draw a picture of Neptune to check for understanding.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore characteristics of Neptune. Have student repeat the names of all the planets until they have them memorized.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 1)** |
| Ask students: How would you describe Neptune to someone who has never seen it? What characteristics about it stand out in comparison to Earth?  |
| **Interactive Technology** |
| Game: “Planet Neptune”: <https://www.math4childrenplus.com/neptune/> |

Lesson 11: What are the objects in the sky? (Earth’s Moon)

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| **Learning Target****Objective****Standard** | There are characteristics of Earth’s Moon that distinguish it from other planets.Students will be able to describe the Earth’s Moon as it differs from other objects in the solar system.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, BrainPOP jr. login, white boards, white board markers, pencils, science notebooks, picture of the Moon (flash card,) flour, salt, glitter, grey paint, marbles, bowls, paintbrushes, spoons, cake pan |
| **Books** | The Moon by Martha E.H. Rustad |
| **Vocabulary** | Reflect: Occurs when a light ray hits a surface and bounces offCrater: A large, round hole in the ground made by an explosion or something falling from the sky |
| **Procedures** | **ENGAGE**Ask the students: What is the object that orbits around the Earth? Discuss how, although each planet in our solar system has moons, the focus will be on the one that orbits around the Earth. Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think the moon might be like: the temperature, what the days are like, and so on.Video: “Outer Space: ‘Time to Shine,’ The Moon Song by StoryBots” (1:58): <https://www.youtube.com/watch?v=i235Y2HRksA&t=6s>**EXPLORE**Video: “BrainPOP jr.: Moon” (4:40): <https://jr.brainpop.com/science/space/moon/>The Moon is about 4.5 billion years old and is the only natural satellite in the Solar System. The Moon formed about 30-50 million years after the Earth formed. The Moon came about when a large object hit the Earth and blasted out rocks that all came together and orbited round the earth. Eventually, they all melted together, cooled down, and became the Moon. Four moons could fit inside of Earth. The students will be making moon rocks. Each pair will need: 2 cups of flour, 1 cup of salt, glitter, marbles (to make craters,) warm water, and grey paint.Mix the flour and salt in a large bowl and stir until it is combined. Slowly add the water, continuing to stir until it is blended well. Add glitter and grey paint and mix well with the dough. Form the dough into a ball, or “moon rock.” Use the marble to make “craters” around the entire rock until it resembles the moon.Video: “Where Did the Moon Come From?” (3:49): <https://www.youtube.com/watch?v=b9x5n_uHxMM>Have students draw a picture of the Moon in their science notebook. Students should also write at least three facts about Earth’s Moon.**EXPLAIN**Book: The Moon by Martha E.H. Rustad, or use the myON link: <https://www.myon.com/reader/index.html?a=sp_moon_s16>The surface of the Moon is covered by craters, which shows the damage caused by large pieces of rock hitting it billions of years ago. From the Earth, we can only see one side of the Moon at a time. The other side is always turned away from us. The first person to make maps of the moon was Galileo. By 1609, he had devised a telescope that could magnify the moon, so he could study its surface. Optional Video: “Bill Nye the Science Guy S01E11 The Moon” (22:59): <https://www.youtube.com/watch?v=lRkcTr9iyeI> |
| **Enrichment** | **EXTEND**To see how the Moon’s craters formed, fill a cake pan with about 2” of flour. From a distance, drop different marbles onto the surface of the flour. What happens when the marbles hit the surface? Have students draw a picture of the result in their science notebooks along with labels. |
| **Closure** | **ELABORATE**The very first Moon landing was in 1969 with NASA’s Apollo 11 mission. The first man on the Moon was Neil Armstrong. The average distance from the Moon to Earth is 238, 857 miles. It would take 153 days of driving nonstop to get there. The temperature of the Moon changes all the time: it goes from -451 degrees Fahrenheit and up to 253 degrees Fahrenheit. The Moon has no atmosphere to keep the temperature constant. Because of the lack of gravity on the Moon, you would only weight 1/6 of your weight as on Earth.  |
| **Assessment** | **EVALUATE**Formative: Check for understanding with students using the drawings in their science notebooks. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Review the different planets studied in the solar system, specifically looking at facts about the Moon. Check for understanding about the studied facts. | Review the different planets studied in the solar system, specifically looking at facts about the Moon. Ask the student: How are the Moon and the Earth the same? How are they different? | Review the different planets studied in the solar system, specifically looking at facts about the Moon. Ask the student: How would the Moon be different if it had an atmosphere, or was made of a different substance, such as a gas like the outer planets? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the Moon and the facts associated with the planet described in the lesson, and/or have the student draw a picture of the Moon to check for understanding.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore characteristics of the Moon. Have student describe how the Moon was formed and got its craters. Check for understanding.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 1)** |
| Ask students: How would you describe the Moon to someone who has never seen it? What characteristics about it stand out in comparison to Earth?  |
| **Interactive Technology** |
| App: “Spacecraft 3D” – Jet Propulsion LaboratoryApp: “Moon Globe” – Midnight MartianApp: “Luna: Sun, Earth, and Moon” – Orkhan NadirliApp: “Grandpa Benny flies to the moon” – The Voice Of Reason LTD |

Lesson 12: How does the Moon move?

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| **Learning Target****Objective****Standard** | The Moon is important to the Earth and exhibits a known cycle called phases.Students will learn that our Moon moves in a very predictable pattern on a daily and monthly basis.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, BrainPOP jr. login, white boards, white board markers, pencils, science notebooks, pictures of the Moon phases(flash cards,) large paper plates, Double-Stuf Oreos, frosting, paper bowls, popsicle sticks, plastic spoons, markers, light bulb, lamp, foam ball |
| **Books** | The Moon Book by Layne deMarin |
| **Vocabulary** | Phase: A part or step in a process: one part in a series of related events or actions; the shape of the part of the moon that is visible at different times during a month |
| **Procedures** | **ENGAGE**Ask the students: Does the Moon look the same every night? What happens to it? Why do you think it might look different? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think the Moon looks like each day, and why they think these changes may happen.Video: “Moon Phases Song” (3:41): <https://www.youtube.com/watch?v=HkvlrWpsnuQ>**EXPLORE**Video: “Why Does the Moon Change?” (3:48): <https://www.youtube.com/watch?v=yXe0yxzYkjo>Students will be making a moon phases model using Oreos. Each student needs: 1 large paper plate, 7 Double-Stuf Oreos, frosting in a bowl, popsicle stick, plastic spoon, and markers. Students should twist each Oreo cookie, and using the plastic spoon, scrape out the filling to show each phase. Once all eight phases are complete, they should be “glued” with the frosting onto the paper plate. Have the students label each phase and draw arrows to show the direction in which the phases are moving. In the center of the plate, the students should draw a picture of the Earth, and across from the new moon should be the sun. Use the scientific terms for each phase: “waxing gibbous,” “first quarter,” and so on.Example: 4th Grade Frolics: Moon Phases: <http://4thgradefrolics.blogspot.com/2012/05/howling-at-moon-and-happy-happy-joy.html>Ask students to Carousel Feedback (<https://www.kaganonline.com/>) to look at everyone’s moon phases. While they are looking, review the moon phases and check for understanding.Video: “Flocabulary – Moon Phases” (4:46): <https://www.youtube.com/watch?v=xBc8QHSsFgE>**EXPLAIN**Book: The Moon Book by Layne deMarin, or use the myON link: <https://www.myon.com/reader/index.html?a=wr_moonb_f11>The phases of the Moon go from a full Moon and back again in just over four weeks. “Waxing” means growing. After a new Moon appears in the sky, the moon starts to wax, as a tiny sliver of light is visible. It grows into a crescent, curving to the left, and then into a half moon. This takes a week, described as the Moon’s first quarter. “Gibbous” means humped and describes the shape of the Moon as it grows from a half Moon to a full Moon. The Moon’s second quarter is when the half Moon grows into a full Moon.Following the full Moon comes the waning Moon. “Waning” means shrinking. The visibility of the Moon begins to get smaller. The third quarter takes the full Moon to a half Moon again, but this time it is the right-hand side of the Moon that shines. Following the half Moon is the waning crescent Moon. The last quarter goes from the half Moon to a crescent Moon, facing right, to the point where the Moon seems to disappear.  |
| **Enrichment** | **EXTEND**Video: “Moon Phases Demonstration” (4:15): <https://www.youtube.com/watch?v=wz01pTvuMa0>This demonstration can be watched but can also be show inside of the classroom. Students can also chart the Moon phases over the course of a month: a nightly observation can be made by each student, then compared and charted each day to see how the pattern follows what was studied about the Moon phases. |
| **Closure** | **ELABORATE**Although the Moon is sometimes described as “shining,” it does not shine on its own. Instead, it reflects the light from the sun to be seen at night. Although the Earth is turned away from the sun at night, the Moon is still facing the sun, and can still be seen during its various phases over the course of a month.  |
| **Assessment** | **EVALUATE**Formative: Check for understanding in each student’s Moon phases activity. Ask students to explain why the moon looks different during each phase. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the different words used to describe the Moon, including the different Moon phases. Review the vocabulary and check for understanding. | Discuss the different words used to describe the Moon, including the different Moon phases. Ask the student: Why do the Moon phases repeat themselves over and over? Could the Moon ever skip a phase, or go in a different order? Why or why not? | Discuss the different words used to describe the moon, including the different Moon phases. Ask the student: Would the Moon phases work the same way on other planets? Why or why not? What would it take for the phases to go in a different order? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different Moon phases described in the lesson, and/or have the student draw the different terms on paper to show the Moon phases.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different ways the Moon orbits the sun, as well as the Moon phases. Repeat the motions with them until they can tell you what they are. *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 3)** |
| Ask students: Can you predict the outcome if the Earth had a second moon? Would it look the same? What would you need to know to predict the phases of the second Moon? |
| **Interactive Technology** |
| App: “MOON – Current Moon Phase” - Charlie DeetsApp: “My Moon Phase – Lunar Calendar” – Full Moon Phases & Moon AlertsGame: SoftSchools.com: “Phases of Moon and Sun”: <http://www.softschools.com/science/space/phases_of_moon/>Game: Science Net Links: “Lunar Cycle Challenge”: <http://sciencenetlinks.com/interactives/moon/moon_challenge/moon_challenge.html> |

Lesson 13: What are the objects in the sky? (Sun)

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| **Learning Target****Objective****Standard** | The sun is planet Earth’s star that has certain movements.Students will be able to describe why the Sun is important to the Earth. 1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, BrainPOP jr. login, white boards, white board markers, pencils, science notebooks, pictures of the sun (flash cards,) large box, plastic water bottles (16 oz.), duct tape, scissors, paint, paintbrushes, food coloring, foil, cups that fit over bottles |
| **Books** | The Sun by Martha E.H. Rustad |
| **Vocabulary** | Refraction: The bending of a ray when it passes at an angle from one medium into another in which its speed is different (as when light passes from air into water)Absorb: To take in or soak upGas: A substance that is like air and has no fixed shape |
| **Procedures** | **ENGAGE**Video: “The Sun Song/Educational Science Video for Kids” (2:06): <https://www.youtube.com/watch?v=OBnDKfHtcd0>Ask the students: What is the Sun? Is it a moon, a planet, or a star? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think about the Sun.Video: “The Sun/Educational Video for Kids.” (3:35): <https://www.youtube.com/watch?v=RzkJkEKV8Yk>Ask the students: Why is this star we call the Sun so important to us? Possible answers include warmth, light, energy, and food.**EXPLORE**Brainstorm the different ways that sunlight is used, including solar panels. True Aim: Light Box Magic: <http://www.trueaimeducation.com/light-box-magic/>Video: “Liter of Light” (4:40): <https://www.youtube.com/watch?v=iUs-A9GPs8c>Students will need a big box, plastic water bottles, duct tape, and scissors. Optional: paint, paintbrushes, food coloring, bleach, foil, and cups that fit over the bottles. You can do this experiment whole group, or if you have enough materials, have the class Mix-Freeze-Group (<https://www.kaganonline.com/>) to create groups of 2-6 to make their own.Students may paint the large cardboard box (optional.) Fill the 16 oz. bottles with water, as well as several drops of food coloring in some of them. Trace the bottom of the bottles on the top of the box and cut holes. Put tinfoil on the top of the box to help the light reflect into the bottles. Cut a small hole or eyeholes in the side of the box to look inside. Push the bottles into the holes on the top and have the students take turns looking in the viewing window. The students can also cover the bottles off and on with the cups to create a “light show.”**EXPLAIN**When the light from the sun hits a solid object, like the cup, it is absorbed. When the light hits the water in the bottle, it bends in all different directions. It bends because the water makes the light slow down. This is called refraction. The water makes the light spread out in the box. Explain that this is also the reason to wear sunscreen by the pool: the water makes the light spread out and people can burn easily from the light. Compare what happens when the sunlight is shown directly through the holes with no water bottles.Video: “Bill Nye the Science Guy on Light Bending & Bouncing (Full Clip)” (2:01): <https://www.youtube.com/watch?v=fD1544bM_c4&list=PL0BDDF4F93A8CE664>Video: “All About the Sun for Kids: Astronomy and Space for Children” (4:56): <https://www.youtube.com/watch?v=VkW54j82e9U&t=32s>The Sun accounts for 99.8% of the total mass of the solar system, although it is just a big ball of gas. It takes 8 minutes and 20 seconds for the light leaving the Sun to reach the Earth. The Sun is 865,000 miles wide, which is 110 times wider than the Earth’s diameter. If the Sun were the size of a beach ball, then Jupiter would be the size of a golf ball, and the Earth would be as small as a pea. About a million Earths could fit inside of the Sun. The Sun is 9,941 degrees Fahrenheit, which is 74 times hotter than the highest temperature ever recorded on the Earth. The Sun is estimated to be about 4.6 billion years old.Book: The Sun by Martha E.H. Rustad, or use the myON link: <https://www.myon.com/reader/index.html?a=sp_sun_s16>Have students draw a picture of the Sun in their science notebook. Students should also write at least three facts about the Sun. |
| **Enrichment** | **EXTEND**Video: “Sun Facts for Kids!” (10:30): <https://www.youtube.com/watch?v=q-QNPfBQylE>Ask the students: What would happen if the Sun was closer or further away? What would happen to the light and temperature on Earth? Why? |
| **Closure** | **ELABORATE** Discuss the sun, as well as its effect on the Earth. Review the idea of the light refracting in the bottles, making the experiment possible.  |
| **Assessment** | **EVALUATE**Formative: Have students name three ways the sun helps the Earth, including what happens when the sun hits the water. Check their science notebook for understanding. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the Sun, as well as the idea of light hitting water. Review the idea that the sun is a star, and it looks larger than others because of how close it is. | Discuss the idea of the Sun, as well as the idea of light hitting water. Review refracting and discuss the different surfaces light can go through or not go through. | Discuss the Sun, as well as the idea of light hitting water. Ask the student: Would the reaction be the same if the Sun’s light went through paper? What substance would create a similar effect? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student explore the Sun and the way it can heat our planet.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different ways the Sun can reflect light. Repeat the terms with them to check for understanding. *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 3)** |
| Ask students: What would happen if there was another star like the Sun on the other side of the galaxy? How would it effect the rotation and orbit of the planets? |
| **Interactive Technology** |
| App: “xSky” – xSKy IncApp: “Solar Vision” – Space Science InstituteGame: “Solar System Scope”: <https://www.solarsystemscope.com/> |

Lesson 14: Why is the day different from the night?

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| **Learning Target****Objective****Standard** | The day/night cycle is due to the movement of celestial objects, in which some are visible during the day, night, or both.Students will be able to explain what causes the day and night, and how this cycle follows a pattern.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, pictures of the sun (flash cards,) chalk, tape measure, clip boards, compass, flashlight, balls to represent the Earth and moon |
| **Books** | Where does the Sun Go at Night? An Earth Science Mystery by Amy S. Hansen |
| **Vocabulary** | Day: The time of light between one night and the nextNight: The time between dusk and dawn where no sunlight can be seenShadow: The dark figure cast on a surface by a body that is between the surface and light |
| **Procedures** | **ENGAGE**Video: “Sesame Street – Cookie Monster P.H.D. explains night and day” (1:47): <https://www.youtube.com/watch?v=nzanaJkvQks>Ask students: Which is your favorite: day or night? Why? Are there objects in the sky that can only be seen at a certain time? For example, can you see the sun at night? Why or why not? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think about the sun, and why it can’t be seen all the time.Video: “Scholastic Study Jams! A Day on Earth” (3:50): <http://studyjams.scholastic.com/studyjams/jams/science/solar-system/day-on-earth.htm>**EXPLORE**Video: “Shadow/The Dr. Bionics Show/Educational Videos For Kids” (2:48): <https://www.youtube.com/watch?v=lOIGOT88Aqc>This activity should be done outside twice a day – preferably first thing in the morning and near the end of the day. Have students work with their partners. Each pair will need a piece of chalk and their science notebook to make observations (optional.) Scholastic: Interactive Science: The Human Sundial: <https://www.scholastic.com/teachers/blog-posts/genia-connell/interactive-science-human-sundial/>Explain that the objective is to examine shadows at different times of the day. Choose a large area of pavement where the students can trace their shadows. Make sure the students spread out. With the class, note the location of the sun using the terminology such as, “the lower part of the eastern sky.” One partner marks an X on the ground in chalk as their starting point and labels the X with their name. That student then stands on the X while their partner traces their shadow. Both students should work together to measure the shadow from heel to the top of the head. Inside the shadow, the students should record the measurement and the time it was taken. Students switch roles and repeat the procedure, then record all the information in their science notebook.When the students go back inside, make sure they record their observation. Discuss what they think will happen the next time they go outside later in the day. Using a flashlight and an object from the classroom, demonstrate what happens when the source of light moves on a shadow. Explain that, like the flashlight, the Earth’s rotation causes the source of light to be in a different location. Go through the exact procedures at least one more time during the day. The student must always stand on their original X to begin. As the day progresses, the students can observe what is happening with their shadows.**EXPLAIN**Book: Where does the Sun Go at Night? An Earth Science Mystery by Amy S. Hansen, or use the myON link: <https://www.myon.com/reader/index.html?a=fgsm_sun_f11>Video: “Following the Sun: Crash Course Kids #8.2” (4:52): <https://www.youtube.com/watch?v=1SN1BOpLZAs>The Earth is a sphere which rotates as it travels around the sun. One side of the Earth faces the sun, while the other side faces away. When the side we are on faces the sun, it is daytime. The side facing away is cooler and darker, and experiences night. Because the Earth is constantly spinning, we experience night and day. The far side of the Earth is in a shadow.Shadows are longest first thing in the morning and shorten until the sun is directly overhead. The sun moves across the sky from the east to the west. A straight line can be drawn from the sun’s location to the shadow’s direction. Their shadows move in a circular, clockwise direction.Video: “Day & night explained” (1:01): <https://www.youtube.com/watch?v=v9J2auAwD_I> |
| **Enrichment** | **EXTEND**BBC: Light and Shadows: <http://www.bbc.co.uk/bitesize/ks2/science/physical_processes/light_shadows/play/>Use the program, either as a class or individually, to explore shadows, both inside and outside.Sometimes, the moon can be seen during the day. The moon is always revolving/orbiting around the Earth, and the Earth is always rotating/spinning. This can be demonstrated with different objects, or even with students: have one object as the Earth rotating, and another object (or person) as the moon revolving around the Earth.Video: “Why Can I See the Moon During The Day?” (3:51): <https://www.youtube.com/watch?v=-Oyv3Qg4a8k> |
| **Closure** | **ELABORATE**Different objects in the sky can be seen at different times due to the rotation of the Earth and the side that is facing the sun. Shadows are formed all the time, whether it is on the Earth or whether it is by the Earth itself. Game: Sid the Science Kid: Shadow Show: <http://pbskids.org/sid/shadowshow.html> |
| **Assessment** | **EVALUATE**Formative: Check for understanding regarding the difference between the daytime and nighttime, as well as their science notebooks. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the difference between night and day, including which objects can be seen at different times. If necessary, demonstrate the rotation with the moon and sun with a flashlight and balls. | Discuss the difference between night and day, including which objects can be seen at different times. Ask student: What other objects are visible at night?  | Discuss the difference between night and day, including which objects can be seen at different times. Ask student: Why can the stars not be seen during the day, but the moon can? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student act out the different terms discussed, including rotation and revolution.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different ways the moon revolves, and the Earth rotates. Repeat the motions with the different balls and flashlight to ensure understanding.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 2)** |
| Ask students: How are the Earth and Sun alike? What if the Earth wasn’t rotating? Would there still be shadows? Why or why not? |
| **Interactive Technology** |
| App: “Day & Night Map” – Volker Voecking Software EngineeringGame: Duckie Deck: “Day and Night”: <http://duckiedeck.com/play/day-and-night> |

Lesson 15: How is the Sun different throughout the year?

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| **Learning Target****Objective****Standard** | For most places on Earth, a change in season means a change in the length of day and night.Students will understand the amount of daylight we have on Earth depends on the time of year.1-ESS1-2: Make observations at different times of year to relate the amount of daylight to the time of year.  |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, pictures of the sun (flash cards,) flashlight, globe, heat lamp, class set of: paper cups, 4 foam balls (each), 8 small skewers (each), crayons, black marker or Sharpie |
| **Books** | Seasons of the Year (Measuring Time) by Tracey Steffora |
| **Vocabulary** | Seasons: Divisions of the year, defined by changes in weather and the position of the Earth in its orbit around the sun; occurring because of the tilt in the Earth’s axis |
| **Procedures** | **ENGAGE**Video: “Seasons and the Sun: Crash Course Kids 11.1” (3:56): <https://www.youtube.com/watch?v=b25g4nZTHvM>Discuss the video. What season are we in now? Are the days short or long? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think about the sun, and why it can’t be seen all the time.**EXPLORE**Video: “Why Are There Seasons?” (2:20): <https://www.youtube.com/watch?v=UQjT5uKp2hg>As a class, experiment with a globe and flashlight to show the different effects of heat on the Earth’s surface. Set the globe on a table. Place the heat lamp on the other side of the table about a foot away from the globe. Rotate the globe to show the rotation of the Earth. Have a student place their hand in front of the globe, and then on the back. Which side was hotter? Describe how the heat lamp is like the sun heating the Earth.The students will be making a diorama of the Earth’s tilt and the effect of the sun on the seasons.Video: “Astronomy 4 Kids: (short) ACTIVITY – An effect of Earth’s tilt, the seasons” (1:05): <https://www.youtube.com/watch?v=IFSsZ2Q3TAg>Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to find a partner. Each student needs a foam cup, 4 foam balls, 8 small skewers, and crayons. Give students the instructions: Each student should color each of the 4 balls to represent 4 phases of the Earth’s rotation. Color the cup, which represents the sun. Using a black marker or Sharpie, draw the equator around each Earth and label the northern and southern hemisphere. Break two of the skewers in half and poke them through the 4 Earth spheres. This is the Earth’s axis of rotation. Poke the remaining skewers through the cup at 4 equidistant spots. Attach each Earth around the sun. All the Earths should tilt the same direction. One is tilted towards the sun; one is tilted way from the sun; two tilt neither towards or away. Discuss the current average temperature and what this means for the tilt of the Earth.Have students draw a picture of the Earth in their science notebooks to depict the different seasons. Ask the students: How do you know what each picture represents? Make sure to have them include labels. **EXPLAIN**Video: “Bill Nye explains Seasons” (4:45): <https://www.youtube.com/watch?v=KUU7IyfR34o&t=72s>Using the models, explain how the seasons are affected by the Earth’s rotation, which also affects the amount of daylight for different times of the year. When the Earth is tilted towards the Sun, this also means the Earth is closer to the Sun. This makes the day longer. The longest day of the year in the northern hemisphere is called the summer solstice, which happens around the middle of June. This is the day the Earth is closest to the Sun in this area. Around December 21st, the northern hemisphere is furthest away from the Sun, and the winter solstice is experienced.The tilt of the Earth has two major effects: the angle of the Sun to the earth and the length of the days. For half of the year, the Earth is tilted so the North Pole is pointed more towards the Sun. For the other half, the South Pole is pointed at the sun. When the North Pole is angled toward the sun, the days in the Northern Hemisphere get more sunlight, with longer days and shorter nights. It also heats up, so they get summer. As the year progresses, the Earth’s tilt changes to where the North Pole is pointed away from the Sun, producing winter.Book: Seasons of the Year (Measuring Time) by Tracey Steffora, or use the myON link: <https://www.myon.com/reader/index.html?a=mtime_ssnsy_s11> |
| **Enrichment** | **EXTEND**The angle of the Sun changes as well. In summer, the sunlight shines more directly on the Earth, giving more energy to the Earth’s surface and heating it up. During the winter, the sunlight hits the Earth at an angle. This gives less energy and doesn’t heat the Earth as much. |
| **Closure** | **ELABORATE**Even though the Earth rotates and revolves around the Sun, this alone does not cause the seasons. Without the tilt of the Earth, the seasons would be much different. For example, at the equator, halfway between the North Pole and South Pole, there are no seasons. This is because the sun always gets high in the sky there. It is always warm at the equator. Optional Video: “Bill Nye the Science Guy S01E15 Seasons” (22:57): <https://www.youtube.com/watch?v=Jp21OUKsbgU> |
| **Assessment** | **EVALUATE**Formative: Check for understanding regarding the difference between the different seasons, as well as checking their science notebooks. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss seasons, including the tilt of the Earth, the Earth’s rotation, and the Earth’s revolution around the Sun. Have student demonstrate these concepts, either by using props or acting them out. | Discuss seasons, including the tilt of the Earth, the Earth’s rotation, and the Earth’s revolution around the Sun. Ask the student: How are the seasons different if someone lives in the southern hemisphere? | Discuss seasons, including the tilt of the Earth, the Earth’s rotation, and the Earth’s revolution around the Sun. Let the student know that days in Alaska are around 6 hours long during the winter. Why would that be? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student act out the different seasons using a ball for a model of the Earth and a flashlight.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different seasons and positions of the Earth in relation to the sun. Repeat the motions with them until they can differentiate between the seasons.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 3)** |
| Ask students: How is the moon related to the seasons? Is there any correlation?  |
| **Interactive Technology** |
| App: “M65 Seasons” – VINCI Education CorporationApp: “Dark Side of the Earth” – Dargan M. FriersonGame: TurtleDiary: “Seasons – Weather Game”: <https://www.turtlediary.com/game/seasons.html>Vegas PBS LearningMedia: “Why Do We Have Seasons?”: <http://d3tt741pwxqwm0.cloudfront.net/WGBH/npls13/npls13_int_seasons/index.html> |

Lesson 16: What are stars, and are they like the sun?

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| **Learning Target****Objective****Standard** | The sun is like the other stars in the sky, only much closer to Earth.Students will understand that stars come in different colors and sizes, but are all sources of energy, and stay in certain patterns known as constellations.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, pictures of stars (flash cards,) white copy paper, clipboard, black construction paper, white crayon or white chalk, a pencil, scissors, tape, paint, paintbrushes |
| **Books** | Space by Martha E.H. Rustad |
| **Vocabulary** | Star: Any of the heavenly bodies except planets which are visible at night and look like fixed points of lightConstellation: The position of stars in the sky: any off 88 groups of stars forming patterns |
| **Procedures** | **ENGAGE**Video: “Outer Space: ‘I’m A Star,’ The Stars Song by StoryBots” (1:46): <https://www.youtube.com/watch?v=7t3aXb3LpWg&t=15s>Ask the students: What is a star? We know that the sun is a star, but are other stars just like the sun? And if they are, why aren’t they as bright as the sun? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think about stars.Ask students: Have you ever seen the stars make patterns in the sky? What do they look like?**EXPLORE**Video: “Constellations: Connect the Dots in the Sky!” (3:44): <https://www.youtube.com/watch?v=1sZ15SUeS9w>There are many constellations in the sky. The students will have a chance to make their own: by either creating one of their own or copying one that already exists.Go Astronomy: Constellations: <http://www.go-astronomy.com/constellations.htm>Education.com: Make Window Constellations: <https://www.education.com/activity/article/window_constellations_first/>Ask students to find their previous partner. Each student will need: white copy paper, clipboard, black construction paper, white crayon or white chalk, a pencil, scissors, tape, paint, and a paintbrush. Attach the white paper to the clipboard. Using the website, show one of the constellations to the class, or have them make their own. Ask the students to draw the constellation, dot-to-dot style. They can also draw their own if you choose. Put the constellation on top of the black construction paper. Use tape to secure the two pieces of paper together. Using the pointed end of the scissors (preferably by the teacher,) poke through the dots that were drawn on the white paper. Be sure to poke all the way through both layers of paper. Remove the white paper. Each student should use a white crayon or piece of chalk to connect the dots on the black paper. The student can then write the name of the constellation at the bottom of the paper. If they have made up their own, they can name their constellation based on what the drawing looks like. Finally, use tape to hang the black paper constellation on a sunny window, where the sun can shine through the holes and make the stars light up in the daylight.Optional: Instead of poking holes through the black paper, students may paint the stars on the black paper and use the white crayon or chalk to connect the dots into a constellation.Have the students draw a picture of a star in their science notebook, as well as one of the constellations. Make sure to label the drawing.Book: Space by Martha E.H. Rustad, or use the myON link: <https://www.myon.com/reader/index.html?a=sle_space_f13>**EXPLAIN**Constellations are useful because they can help people recognize stars in the sky. By looking for patterns, the stars and locations can be much easier to spot. The constellations were used to keep track of the calendar, so people knew when to plant and harvest crops. Constellations were also used for navigation. The North Star was used for navigators to figure out where they were to help ships travel across the oceans.Video: “Lin-Manuel Miranda, Opetaia Foa’I – We Know The Way (From Moana)” (2:35): <https://www.youtube.com/watch?v=ubZrAmRxy_M>Video: “What Are Stars?” (3:38): <https://www.youtube.com/watch?v=ZrS3Ye8p61Y>A star is a massive, bright sphere of very hot gas called plasma, which is held together by gravity. Unlike the moon, stars produce their own light. There are approximately 200-400 billion stars in the Milky Way Galaxy alone. Very hot stars look white or blue; cooler stars look red or orange. People have used the North Star for centuries to guide them.Video: “Stars for Kids/Stellar Evolution for Kids/Evolution of a Star” (3:53): <https://www.youtube.com/watch?v=fgqnh_6cCE4&t=42s> |
| **Enrichment** | **EXTEND**People have always looked for patterns in the stars. The people of ancient Greece knew 48 constellations, named after mythical beings. These patterns don’t really look like what they were named after. Today, scientists recognize 88 constellations. These modern constellations are not just patterns of stars, but whole segments of sky that fit together like puzzle pieces to form a complete sphere.DKfindout!: Constellations: <https://www.dkfindout.com/us/space/constellations/> |
| **Closure** | **ELABORATE**Not all constellations are visible from any one point on the Earth. The star maps are typically divided into maps for the northern hemisphere and maps for the southern hemisphere. The season of the year can also affect what constellations are visible. The largest constellation is Hydra, which takes up 3.16% of the sky. The word “constellation” comes from a Latin term meaning “set with stars.”Optional Video: “Bill Nye The Science Guy on Outerspace (Full Clip)” (2:06): <https://www.youtube.com/watch?v=BdAqq-wEQV0&list=PLSvZ2UyLg63puV1ULdmPRCnE_ngxSVbyC> |
| **Assessment** | **EVALUATE**Formative: Ask students to explain the constellations they made to you, as well as having them tell you the closest star to the Earth (the sun) as well as checking their science notebook for understanding. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the idea of stars, as well as constellations. Have student describe a star, the one that is closest to Earth, and name a constellation.  | Discuss the idea of stars, as well as constellations. Have student name different constellations, as well as describing what they look like to them (i.e. “Orion might look like a scorpion, etc.) | Discuss the idea of stars, as well as constellations. Ask student: If there are billions of stars in the universe, why are there only 88 constellations?  |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student draw some of the constellations.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore pictures of the different constellations, as well as pictures of different types of stars. Repeat the motions with them until they can explain what a constellation is.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 2)** |
| Ask students: How could you organize the different constellations? Why is the North Star the one most commonly used for navigation? |
| **Interactive Technology** |
| App: “Night Sky” – AR Guide To The Sky AboveApp: “Star Chart” – Escape Velocity LimitedApp: “StarTracker Lite – Mobile SkyMap” – Planetarium for astronomy fansApp: “OSR Star Finder” – DTT Multimedia B.V.Game: PBS Kids: Constellations: <http://pbskids.org/readyjetgo/games/mindy/index.html>Game: KidsAstronomy.com: Constellation Hunt: <http://www.kidsastronomy.com/astroskymap/constellation_hunt.swf> |

Lesson 17: What are the objects in the sky? (Comets and Asteroids)

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| **Learning Target****Objective****Standard** | The sun is like the other stars in the sky, only much closer to Earth.Students will understand that stars come in different colors and sizes, but are all sources of energy, and stay in certain patterns known as constellations.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, pictures: comets, asteroids (flash cards,) water, sand, dark corn syrup, ammonia-based window cleaner, flour, crushed dry ice, measuring cups, cup, mixing bowl, spoon, heavy gloves, plastic trash bags, spoon |
| **Books** | Show Me Space: My First Picture Encyclopedia by Steve Kortenkamp |
| **Vocabulary** | Comet: A small object made from dust and ice, like a dirty snow ballAsteroid: A chunk of rock and metal in outer space that is in orbit around the sunDwarf Planet: An object orbiting around the Sun that is large enough to be rounded by its own gravity, but not gravitationally dominant in its orbital area and is not a moon |
| **Procedures** | **ENGAGE** Video: “Sesame Street – ‘Planets, Moon and Stars (CGI version)” (1:16): <https://www.youtube.com/watch?v=88jFV8jguW4>Ask the students: What are some of the other objects in the Solar System besides the planets, moons, and stars? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to get into partners to discuss what they think is in the sky. Create a circle map to record the different answers.**EXPLORE**Book: Show Me Space: My First Picture Encyclopedia by Steve Kortenkamp, or use the myON link: <https://www.myon.com/reader/index.html?a=mfpe_space_s13>In their partners, discuss a few of the different objects in space besides those already explored. Ask the students: What do you think a comet is made of? What about an asteroid? Video: “How to Make a Comet in Your Kitchen” (2:41): <https://www.youtube.com/watch?v=IIaKvb7UleE>For the experiment, it should be done by the teacher and watched by the class. The teacher will need: water, rocks, dust, window cleaner, flour, dry ice, measuring cups, cup, mixing bowl, spoon, heavy gloves, and plastic trash bags. Layer two sheets of the plastic trash bags into a large bowl. Pour two cups of water into the bowl. Add about 2 spoonfuls of sand into the water and mix well. Add about a tablespoon of ammonia-based window cleaner. Add about a table spoon of dark corn syrup, stirring well until mixed. Mix in 2 cups of crushed dry ice while stirring vigorously. Continue stirring until the mixture is almost totally frozen. Lift the comet out of the bowl using the plastic liner. Wearing work gloves, shape the comet as if you were shaping a snowball. Unwrap the comet as soon as it is frozen sufficiently to hold its shape.The comet can be placed on display for the students to watch during the day as it turns from a solid to a gas. Do not allow students to touch the comet directly. Have the students draw a picture of a comet and an asteroid their science notebook. Make sure to label the drawing.**EXPLAIN**Video: “Comets and Asteroids!” (4:00): <https://www.youtube.com/watch?v=02wrLS-ue1Q>Comets are made from dust and ice, like a dirty snowball. Comets originate from the very edge of the Solar System, where millions of comets are swishing around in every direction. When they crash into each other, they change directions, which can bring them into the Solar System. Unfortunately, they don’t live very long once they enter the warmer part of the Solar System. After several thousand years, they melt down to a little bit of ice and dust.A comet’s tail is formed once it gets close to the sun and begins to melt. The debris forms a tail, which will always point away from the sun because of the sun’s heat and radiation. Book: Space Leftovers: A Book About Comets, Asteroids, and Meteoroids by Dana Meachen Rau, or use the myON link: <https://www.myon.com/reader/index.html?a=as_mecom_f05>There is also a ring in space that separates the inner planets (Mercury, Venus, Earth, and Mars) from the outer planets (Jupiter, Saturn, Uranus, and Neptune.) It is known as the Asteroid Belt. The asteroid belt was first discovered in 1801. There are thousands and thousands of asteroids, rocks, and debris within the asteroid belt. Some scientists believe the debris may be from a planet that never formed. Many of the bigger asteroids have been given names such as Ceres, Gaspra, and Ida. Video: “The Asteroid Belt Song/Asteroid Belt Song for Kids/Asteroid Belt Facts/Silly School Songs” (2:32): <https://www.youtube.com/watch?v=iLFqJm_V2Jw> |
| **Enrichment** | **EXTEND**Pluto is a dwarf planet. Dwarf planets are small, round objects which orbit the sun with many other smaller objects nearby. There are five dwarf planets in the Solar System, and all are smaller than Earth’s moon. Ask the students: Why do you think Pluto used to be called a planet, but isn’t anymore?Video: “Pluto Song for Kids/Pluto Facts/The Pluto Song/Silly School Songs” (3:10): <https://www.youtube.com/watch?v=P5ipVlY5p7w> |
| **Closure** | **ELABORATE**The word “asteroid” means “star-like.” They were given this name because they can only be points of light in most telescopes. The word “comet” means “hairy star.” Most comets are so small that they cannot be seen, even in the biggest telescopes. But we can see them when they head inwards toward the Sun and grow tails of gas and dust. Optional Video: “Bill Nye the Science Guy S05E15 Comets and Meteors” (22:56): <https://www.youtube.com/watch?v=uoLCzpbpaOY> |
| **Assessment** | **EVALUATE**Formative: Ask students to explain meteors and asteroids to you, as well as checking their science notebooks for understanding. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the difference between a comet and an asteroid, as well as comparing it with other objects in the Solar System such as planets and moons. Give student time to explore the different flash cards of each object to differentiate between them. | Discuss the difference between a comet and an asteroid, as well as comparing it with other objects in the Solar System such as planets and moons. Ask the student: Why do you think there aren’t more comets closer to the sun? | Discuss the difference between a comet and an asteroid, as well as comparing it with other objects in the Solar System such as planets and moons. Ask the student: What is the major difference between a comet and an asteroid? What about a dwarf planet? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student draw a picture of a comet and an asteroid.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore pictures of asteroids and comets as well as pictures of some of the dwarf planets. Repeat quizzing them on the flash cards until they can differentiate between the items.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 2)** |
| Ask students: How is Pluto being classified as a dwarf planet related to its distance from the sun? Why do you think it was originally called a planet? |
| **Interactive Technology** |
| App: “Comet ISON” – Wobbleworks LLCApp: “Comets – Snowballs from Outer Space” – John KennedyApp: “Meteors and Meteorites” – John KennedyApp: “Galaxeon Space Asteroid Arcade” – Croma Produccions Multimedia SLGame: NASA Space Place: “Tails of Wonder”: <https://spaceplace.nasa.gov/tails-of-wonder/en/#/review/tails-of-wonder/preloader.swf?path=/review/tails-of-wonder/stardust>Game: “Planet Impact”: <http://amazingspace.org/resources/explorations/impact/home.html>Game: PBS Kids: Ready Jet Go!: “Sydney’s Astro-Tracker”: <http://pbskids.org/readyjetgo/games/astro/index.html> |

Lesson 18: What are the objects in the sky? (Solar System)

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| **Learning Target****Objective****Standard** | There are different types of objects in the sky that can be seen using different methods.Students will be able to differentiate between planets, moons, and stars. 1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. |
| **Materials** | Computer, white boards, white board markers, pencils, science notebooks, pictures of the objects in the Solar System (flash cards,) compass, Sharpie marker, paper plates with orbit lines already drawn, popsicle sticks, butterscotch candy, a few Nerds candies, snow caps, M&Ms, peppermints, life savers, lemon drops, whoppers, gum drops, squares of wax paper, cake frosting, orange tube of icing |
| **Books** | There’s No Place Like Space: All About Our Solar System by Tish Rabe |
| **Vocabulary** | Solar System: A star with the group of heavenly bodies that revolve around it; especially: the sun with the planets, moons, asteroids, and comets that orbit it |
| **Procedures** | **ENGAGE**Video: “Solar System/Solar System Song/Planets Song for Kids/8 Planets” (3:08): <https://www.youtube.com/watch?v=mQrlgH97v94>Ask students: What are some of the different objects in the sky we have learned about in this lesson? As a class, finish up the KWL chart about the sun, moon, stars, asteroids, comets, and different patterns they make in the sky.Book: There’s No Place Like Space: All About Our Solar System by Tish Rabe**EXPLORE**Video: “Solar System 101/National Geographic” (4:10): <https://www.youtube.com/watch?v=libKVRa01L8>E is for EXPLORE! Candy Solar System: <http://eisforexplore.blogspot.com/2012/04/candy-solar-systems.html>Before the project, use the compass and Sharpie marker to draw orbit lines for 8 planets on the paper plates. The orbits do not have to be scaled. For the model, each student needs: 1 paper plate with orbit lines already drawn, popsicle sticks, butterscotch candy, a few Nerds candies, snow caps, M&Ms, peppermints, life savers, lemon drops, whoppers, gum drops, and a square of wax paper. Ask students to StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to find a partner. Give each student a spoonful of frosting on the wax paper. Using the popsicle stick, each student should put some frosting “glue” on one side of the candies to create the Solar System. The candy should be placed at the center of the plate. Using the same method, have the students affix each of the eight planets to its appropriate object. Instruct student at each step and tell them a little bit about each planet as they glue it into place. Have students pass the tube of orange icing around the room. Each student can “paint” Saturn’s rings onto the candy (yellow lemon drop) using the orange tube of icing. Each student can use a marker or a crayon to draw the moons around each planet. Have the students label each planet. For the asteroid belt, nerds can be used between Mars and Jupiter. Here are some ideas for each planet:Sun: Butterscotch candyMercury: NerdVenus: Snow CapEarth: Blue M&MMars: Red M&MAsteroid belt: NerdsJupiter: Peppermint candyVenus: Life saverUranus: WhopperNeptune: Gum dropHave students draw a picture in their science notebook in addition to making the model. Make sure to label all the items in the Solar System.**EXPLAIN**Video: “Learning About The Planets in Our Solar System” (20:01): <https://www.youtube.com/watch?v=jEXWxNbpTzU>Different objects in our Solar System are drastically different sizes. However, in our Solar System, most objects revolve around the sun, or revolve around the planets that revolve around the sun. While the planets are revolving around the sun, they also rotate at varying speeds.  |
| **Enrichment** | **EXTEND**Even though we know a lot about our Solar System, we are still learning all we can about space. However, there is only so far that we have gone into space. What do you think might be beyond the edge of the Solar System?Video: “The Farthest We’ve Ever Gone in Space” (4:21): <https://www.youtube.com/watch?v=L1UiaMNK614> |
| **Closure** | **ELABORATE**Describe the Solar System, and all the different planets and other objects to be found within. Ask the students: Should the Solar System continued to be studied? Why or why not? |
| **Assessment** | **EVALUATE**Summative: Check the rubric for understanding. Review items as necessary. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the planets and objects in the solar system. Show the student pictures of each object in the Solar System for review. | Discuss the different planets and objects in the solar system. Ask the student: How would our Solar System be different if you removed a planet or a star? | Discuss the different planets and objects in the solar system. Ask the student: Why do you think it is important to know and understand what is in our Solar System? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different planets described in the lesson, and/or have the student draw the objects described in the lesson.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the planets and other items throughout the Solar System. Have student repeat the names until they have them memorized.*Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 3)** |
| Ask students: How would you compare the different objects in the Solar System? Which ones are the same? Which are different? Why? |
| **Interactive Technology** |
| App: “NASA” – NASAApp: “Solar Walk Ads+: Explore Space” – Astronomy, Stars and PlanetsApp: “solar System Augmented Reality” – Walk around the planets in AR!Game: Education and Public Outreach: “Planet Size Comparison”: <http://www.messenger-education.org/Interactives/ANIMATIONS/Planet_Size_Comparison/planet_size_comp.php>Game: Solar System: Identify Planets: <http://www.softschools.com/science/space/solar_system_kids_games/>Game: National Geographic Kids: “Planets Memory”: <https://kids.nationalgeographic.com/games/quick-play/planets-memory/> |

Earth Science Activity: Sun Pattern Observations (3-4 Weeks)

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| **Learning Target****Objective****Standard** | Students will make observations to describe patterns that can be predicted.Students will investigate and record the different daily patterns of the sun over a significant amount of time.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted.1-ESS1-2: Make observations at different times of year to relate the amount of daylight to the time of year. 1.MD.3: Tell and write time in hours and half hours using analog and digital clocks.1.MD.4: Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many are in one category than in another. |
| **Materials** | Computer, white boards, white board markers, science journals, pencils, blank individual calendars, large blank calendar for classroom (anchor chart)  |
| **Books** | Times of the Day by Tracey Steffora |
| **Vocabulary** | Meteorologist: A person who studies the science that deals with atmosphere and weather |
| **Procedures** | **ENGAGE**Ask the students: Do you think the sun rises and sets at the same time every day? We know the seasons are different, and the days get shorter and longer. But what does that look like over the course of a month? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to predict what will happen as the times of the sunrise and sunset are observed over the course of a month.Video: “Sesame Street: Kermit’s Weather Calendar” (5:13): <https://www.youtube.com/watch?v=8dAp78XJUsQ&t=18s>Although the calendar won’t include the weather, it will include the time of the sunrise and sunset.**EXPLORE**Each student will be making their very own calendar to record the time of the sunrise and sunset over the course of a month.Teacher’s note: This activity can be done on its own, or simultaneously with other science activities – possibly integrated into calendar time (if applicable.) Give each student a blank calendar. Write the name of the month (or months depending on when the observations are set to begin and end.) Fill in the days for each month for a duration of 4-5 weeks. Explain to the class they will be writing down the time the sun rises and sets every school day for a month to see if there are any patterns. The next thing to decide would be the time of day to record the times of the sunrise and sunset. Ask the class: Will we be able to check the sunrise and the sunset when they happen? Why or why not? Give students a chance to brainstorm ideas for how they will be able to check the times even though they are not at school. If they do not arrive at the conclusion to check the weather online, suggest going to The Weather Channel website. On this website, the time of the sunrise and sunset is included. Show the students the website and where the information is located.Finally, the class needs to decide how the time of the sunrise and sunset is going to be measured. Will they be using Fahrenheit or Celsius? Do they want to include any other information, such as the weather that day? Make sure to set up the class calendar the same way the individual calendars are being set up.The Weather Channel: <https://weather.com/>Optional website: Time and Date: <https://www.timeanddate.com/sun/usa>Once the calendars are set up, make the first observation. Use whatever website and information you decided on as a class to record the data every day for 3-4 weeks.After a week, look at the times of the sunrise and sunset. Ask the class: How have the times changed? How has it stayed the same? Based on the times this week, do you think next week will be the same? Why or why not? Write down the predictions on a circle map based on the class observations. Explain how the season may have something to do with the time of the sunrise and sunset. **EXPLAIN**Book: Times of the Day by Tracey Steffora, or use the myON link: <https://www.myon.com/reader/index.html?a=mtime_tmsday_s11>The tilt of the Earth is what determines our seasons, as well as the length of time during the day. In the later months of the year (October through December,) when the Earth is tilted away from the sun, the sunrise happens later, and the sunset happens earlier.Website: Timeanddate.com: Sunrise, Sunset: <https://www.timeanddate.com/sun/usa>Using the Time and Date website, look at the yearly data from your city. What do you notice as you move the graph? Video: Vegas PBS: “Observe Sunrise and Sunset” (1:06): <https://vegas.pbslearningmedia.org/resource/ess05.sci.ess.eiu.riseset/observe-sunrise-and-sunset/#.Wtd6f4jwaUk> |
| **Enrichment** | **EXTEND**After 3-4 weeks, look at the data and ask the students: What do you notice? How are the times changing? Depending on the time of year the calendar is completed, tie the observations into the change of seasons. Make a line graph to show the change in the times of the sunrise and sunset.Ask the class: What do you think the times will be next month? Do you think the pattern will stay the same? Why or why not?  |
| **Closure** | **ELABORATE**By examining the times of the sunrise and sunset every day, students can see whether there is a pattern or not. The pattern of the sunrise and sunset matches the time of year, along with the seasons. This data is important for meteorologists to track to ensure there isn’t a change in this pattern and that the different seasons are occurring as usual.  |
| **Assessment** | **EVALUATE**Formative: Check the students’ journals and observations for understanding, as well as listening to student-led discussions. Summative: See assessment. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss how the times changed over the course of the observation, and the correlation to the season (or season change) happening. Review the student’s science notebook to check for understanding.  | Discuss how the times changed over the course of the observation, and the correlation to the season (or season change) happening. Ask the student: What did you notice about the times of the sunrise and sunset? Did they stay the same or change? Why? | Discuss how the times changed over the course of the observation, and the correlation to the season (or season change) happening. Ask the student: Could you use your observations to predict next month’s sunrise and sunset? Why or why not? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student discuss different sunrise and sunset observations.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different types of weather observed. Repeat the terms with them until they can explain the reasons for the time changes in the sunrise and sunset. *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 2)** |
| Ask students: How would you apply what you learned to develop a sunrise and sunset forecast for the same month next year? Do you think it would be the same? Why or why not? |
| **Interactive Technology** |
| App: “Sunrise Sunset Times” – Local Sun Rise and Set TimeApp: “The Sun: Sunrise sunset times” – Calendar sunrise sunsetApp: “Sunrise – Moon Phase” – AVIA |

**Sunrise/Sunset Observation Assessment**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Draw and label one of the days discussed over the past few weeks, including the time of sunrise and sunset.

Write 3 facts about the days you observed. (Example: How did the time change during the observations? Why did this happen?)

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Earth Science Activity: Moon and Stars Pattern Observations (3-4 Weeks)

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| **Learning Target****Objective****Standard** | Students will make observations to describe patterns that can be predicted.Students will investigate and record the different daily patterns of the moon and constellations over a significant amount of time.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted.1.MD.3: Tell and write time in hours and half hours using analog and digital clocks.1.MD.4: Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many are in one category than in another. |
| **Materials** | Computer, white boards, white board markers, science journals, pencils, blank individual calendars, large blank calendar for classroom (anchor chart)  |
| **Books** | Times of the Day by Tracey Steffora |
| **Vocabulary** | Constellation: The position of stars in the sky: any off 88 groups of stars forming patterns |
| **Procedures** | **ENGAGE**Ask the students: We know the moon changes patterns with the moon cycle. How does this cycle work? Does it change every day? How long does it take for the moon to go through an entire cycle? What about the stars? Do you think the stars have predictable patterns as well? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to predict what will happen as the moon phases and stars are observed over the course of a month.**EXPLORE**Each student will be making their very own calendar to record the phase of the moon over the course of a month.Teacher’s note: This activity can be done on its own, or simultaneously with other science activities – possibly integrated into calendar time (if applicable.) Give each student a blank calendar. Write the name of the month (or months depending on when the observations are set to begin and end.) Fill in the days for each month for a duration of 4-5 weeks.The next thing to decide would be how the students are going to record the phase of the moon. Ask the class: Will we be able to check the phase of the moon as a class as it is happening? Why or why not? Give students a chance to brainstorm ideas for how they will be able to check the phase even though they are not at school. Optional: The calendar can be sent home and checked every night, or different students can each be responsible for one day. The calendar can then be brought back with the student’s observation to be recorded on the class calendar. If they do not arrive at the conclusion to check the moon phases online, suggest going to The Moon Giant website. On this website, the moon phases and a picture of the moon is highlighted. Show the students the website and where the information is located.Moon Giant: <https://www.moongiant.com/phase/today/>To complete the star experiment: Look skyward and pick out a bright star; then line it up with a nearby landmark (like a telephone pole or the peak of your neighbor’s roof.) Make sure you note the exact time and the exact spot when you lined up the star. Then, come back the next night at the exact same time and stand in the exact same place. You’ll see that the star has shifted slightly to the right (west) of the position it was in the previous night. The westward drift of the stars is a motion that is in addition to the daily rising, circling, and setting; because the Earth does not simply stand in the same spot in space and spins. Once the calendars are set up, make the first observation online or assign it for homework. Use whatever website and information you decided on as a class to record the data every day for 3-4 weeks. Draw a picture of the moon and its current phase on the calendar every day.After a week, look at the moon phases so far. Ask the class: How have the phases changed? Based on how different it looks every day, do you think next week will be the same? Why or why not? Write down the predictions on a circle map based on the class observations. Have the students draw a picture of the moon phases in their science notebook, along with labeling them.**EXPLAIN**Video: “Learning About The Moon and Its Phases” (6:44): <https://www.youtube.com/watch?v=UhhSmpFtg7k&t=63s>The lunar phase is the amount of the moon you can see from Earth depending on how much of it is lit up by the sun. The moon is illuminated because it reflects the light from the sun. The part of the moon facing the sun is lit up; the part facing away is in darkness. The phases of the moon depend on its position in relation to the Sun and the Earth. The phases of the moon work in a cycle starting with the new moon. A complete cycle of the moon’s phases from new moon to full moon takes about 29.5 days. Even though the stars don’t move, the Earth’s rotation around the sun makes different constellations visible at different times. Video: “Constellation Location: Crash Course Kids #31.2” (3:48): <https://www.youtube.com/watch?v=BbzCA0Lgf3Y&t=149s> |
| **Enrichment** | **EXTEND**After 3-4 weeks, look at the data and ask the students: What do you notice? How are the phases changing? Ask the class: What do you think the phases will be next month? Do you think the pattern will stay the same? Why or why not?  |
| **Closure** | **ELABORATE**By examining the different moon phases every day, a predictable pattern can be determined. Reading about this pattern is one thing; seeing it and documenting it is another thing. Just like the moon has predictable phases, the way the stars are viewed also have a pattern that is predictable based on the way the Earth orbits the Sun.  |
| **Assessment** | **EVALUATE**Formative: Check the students’ journals and observations for understanding, as well as listening to student-led discussions. Summative: See assessment. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss how the phases changed over the course of the observation, and the correlation to the point in the lunar cycle. Review the student’s science notebook to check for understanding.  | Discuss how the phases changed over the course of the observation, and the correlation to the point in the lunar cycle. Ask the student: What did you notice about the moon phases? Could they ever go in a different order? Why or why not? | Discuss how the phases changed over the course of the observation, and the correlation to the point in the lunar cycle. Ask the student: Knowing the lunar cycle, would you be able to predict the phase of the moon six months from now? Why or why not? |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student discuss the different moon phases.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different phases of the moon. Repeat the terms with them until they can explain the reasons for the different phases and why the moon looks different every day. *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 2)** |
| Ask students: How would you apply what you learned to develop a lunar calendar for the same month next year? Do you think it would be the same? Why or why not? |
| **Interactive Technology** |
| App: “Moon Phase Plus” – The Full Moon Phases CalendarApp: “Moon Phases and Lunar Calendar” – Full Moon PhaseApp: “SimpleMoon – See the Moon Phase” – Tag Along KGame: Match the Memory: “Phases of the Moon Matching Game”: <https://matchthememory.com/BESLclass>Game: Harcourt School: “Phases of the Moon”: <http://www.harcourtschool.com/activity/science_up_close/210/deploy/interface.swf> |

**Moon Observation Assessment**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Draw and label one of the days observed over the past few weeks, including labeling the moon phase.

Write or draw three phases of the moon, including their names.

1.

2.

3.

**Earth Science Unit Assessment**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Look at the moon phases to answer the question.

Draw a the phase of the moon that comes next and label it.

2. True or false: The sun is a star.

1. True
2. False

3. Constellations are made up of:

 a) Asteroids

 b) Comets

 c) Planets

 d) Stars

4. Three objects in space that have predictable patterns are:

 a) The sun, moon, and comets

 b) The sun, stars, and asteroids

 c) The moon, stars, and black holes

 d) The moon, stars, and sun

5. True or false: The sun rises and sets at the same time every day all year.

 a) True

 b) False

6. Shadows change throughout the day because:

 a) The sun moves closer and further away from the Earth

 b) The Earth rotates on its axis

 c) Shadows are alive

 d) The moon controls the shadows

7. The season where the days are the longest is:

 a) Summer

 b) Fall

 c) Winter

 d) Spring

8. Draw and label 4 objects in the Solar System.

9. Draw and label a constellation, either an existing one or one that is made up.

10. List three differences between the inner planets and the outer planets.

11. List the planets in order from closest to the sun to furthest away.

12. Explain why there is day and night on Earth.

Student Research Project: What do the objects in the solar system look like?

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| **Learning Target****Objective****Standard** | Each object in the solar system has distinct characteristics that make it unique from others.Students will pick an object from the solar system to research and present it to the class, along with a model of the object.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted.W.1.7: Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions.)W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.RI.1.3: Describe the connection between two individuals, events, ideas, or pieces of information in a text.RI.1.9: Identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures.)SL.1.4: Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.SL.1.5: Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings. |
| **Materials** | Computer, white boards, white board markers, science journals, pencils, crayons, access to the Internet for students |
| **Books** | Previous text materials from unit lesson |
| **Vocabulary** | Solar system: A star with the group of heavenly bodies that revolve around it; especially: the sun with the planets, moons, asteroids, and comets that orbit it |
| **Procedures** | **ENGAGE**Ask the students: What are the different objects in the solar system? Review what has been learned so far about the planets, stars, moons, asteroids, and comets. Discuss the order of the planets, how they orbit the Sun, and how there are different constellations in the sky. Ask the students: How would you tell the different objects in the solar system apart if you were describing them to people? For example, how would you describe Mercury as opposed to describing the Earth? Ask students to Mix-Pair-Share (<https://www.kaganonline.com/>) to brainstorm about the different characteristics of each object and how it is distinguished from the others. **EXPLORE**Give the students an opportunity to choose which object they would like to study. Objects may include, but are not limited to: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, comet, International Space Station, Moon, space shuttle, Sun, stars, constellations, and the asteroid belt. Two students may need to study each object depending on the class Introduce the different websites and books the students will be able to use to write their research. Kids Astronomy: <http://www.kidsastronomy.com/>Planets For Kids: <http://www.planetsforkids.org/>NASA Science: Solar System Exploration: <https://solarsystem.nasa.gov/solar-system/our-solar-system/overview/>The 8 Planets Just for Kids: <http://kids.nineplanets.org/>ESA Kids: Our Universe: <http://www.esa.int/esaKIDSen/OurUniverse.html>Easy Science for Kids: Solar System – The Sun and Planets: <http://easyscienceforkids.com/all-about-the-solar-system/>Students may also use any of the previous books used throughout the unit.Once the students have chosen an object, they will conduct research on the object. Students can work in pairs or independently depending on the teacher’s discretion. Students should take notes regarding the solar system object they chose, and include the following information:* The name of the space object
* Features of the object (size, color)
* Location in space
* Movement (orbit, rotation)
* Three other interesting facts

Based on their research, the paper should be about a page long, with more than one source used and listed. Students may use an outline to take notes on their object.The students will also be asked to give a presentation to the class. They may want to practice this several times. They must be able to describe their space objects, including the different features they researched. Once they finish their research, they should draw and color a picture based on what they have discovered.Students may need several days to complete the research activity.**EXPLAIN**Earth is the only planet in the solar system that’s known to have water. Because of this, Earth is the only planet with life. Organisms can’t live without water, so we need to take care of the supply we do have. Understanding the solar system can allow us to compare them to our home planet. Other objects in the solar system affect our lives as well. The Sun’s energy can change the surface of satellites used from the Earth, as well as providing heat and light to maintain life on Earth. Studying the stars can help us determine how we got all the other elements that make up things around us, including carbon, oxygen, and so on. |
| **Enrichment** | **EXTEND**Have the students create a model at home of the object they studied. The model can either be 2-dimensional (poster) or 3-dimensional. The model should be an accurate representation of the space object. It should be easy to see from a distance and easy to present. The model should be able to be identified without using much prior knowledge about it (i.e. “Mars” should look like “Mars.”) If the student decides to do a poster, they only need to have the picture and a name of the object, although it may include a few interesting facts. The object does not have to be complicated but does need to be the student’s original work. Materials may be purchased to build the object, but the object should not be bought from the store already completed.  |
| **Closure** | **ELABORATE**Understanding the universe around us helps us to understand life on Earth, especially in comparison to the rest of the solar system. |
| **Assessment** | **EVALUATE**Summative: See rubric |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the different types of objects in the solar system. Student may require assistance in writing or drawing and can be paired up with a student at a higher level.  | Discuss the different types of objects in the solar system. Student may be able to work more independently with teacher support. | Discuss the different types of objects in the solar system. Student may be able to work completely independently, as well as being paired with a student of a lower ability level. |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student discuss different objects in the solar system and why they should be studied.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore different objects in the solar system. Repeat going over the different objects until they can be repeated and explained. *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 2)** |
| Ask students: How could you organize the objects on the solar system? Do you think there are other objects within our solar system we have not yet discovered? Why or why not? |
| **Interactive Technology** |
| App: “Solar System Scope” – INOVE, s.r.o.App: “Planetarium Zen Solar System” – Ghulam JewelGames: NASA Space Place: <https://spaceplace.nasa.gov/> |

First Grade Writing Rubric

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| **Standard** | **Exceeds Expectations - 3** | **Meets Expectations - 2** | **Below Expectations - 1** |
| 1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. | Student included 3 or more details about their solar system object. | Student included 2 details about their solar system object. | Student included 1 or no details about their solar system object. |
| W.1.7: Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions.) | Student participated fully in research. | Student somewhat participated in research. | Student did not participate in class research. |
| W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. | Student used at least 2 sources to find information about their solar system object. | Student used one source to find information about their solar system object. | Student did not use sources to find out information about their solar system object. |
| RI.1.3: Describe the connection between two individuals, events, ideas, or pieces of information in a text. | Student used two sources to connect information about their solar system object. | Student used one source to locate information about their solar system object or did not make a connection. | Student did not use sources or make a connection for information about their solar system object. |
| RI.1.9: Identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures.) | Student found similarities and differences in two different sources t regarding information about their solar system object. | Student found similarities or differences between two sources on their solar system object. | Student did not find similarities or differences between sources on their solar system object. |
| SL.1.5: Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings. | Student created a 2- or 3-dimensional representation of their object that closely resembled their topic. | Student created a 2- or 3-dimensional representation of their object that somewhat resembled their topic. | Student did not create a representation of their object, or the object does not resemble their topic. |
| SL.1.4: Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly. | Student was able to clearly present their solar system object. | Student was somewhat able to present their solar system object. | Student was unable to present their solar system object. |

Points: \_\_\_\_\_\_ / \_\_\_\_\_\_\_= \_\_\_\_\_\_\_\_% Comments:

STEM Engineering Unit Project

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| **Learning Target****Objective****Standards** | Engineering design is a process used to solve real world problems. Students willuse the five-step engineering design process to solve problems.The sun follows a predictable pattern in our sky on a daily and yearly basis. It also provides important things for planet Earth, such as light and heat. In this project, students will use their knowledge about the sun to design and build a solar cooker to make s’mores.1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted.1-ESS1-2: Make observations at different times of year to relate the amount of daylight to the time of year. K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.K-2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.  |
| **Materials** | Computer, white boards, white board markers, science journals, pencils, heat lamp, materials for each group: pizza box, pencil, ruler, scissors, aluminum foil, glue, black construction paper, tape, 1-2 clear sheet protectors or saran wrap, graham crackers, chocolate bars, marshmallows, thermometers |
| **Books** | Solar Power (Tales of Invention) by Chris Oxlade |
| **Vocabulary** | Solar: Using the sun’s rays specially to produce heat or electricityOven: A chamber used for baking, heating, or drying |
| **Design Process** | **ASK**  Identify the problem. Identify the constraints**IMAGINE** Identify some possible solutions**PLAN** Draw a plan and identify the materials**CREATE** Use the plan and create. Test it!**IMPROVE** Modify your design to make it better. Test it out! |
| **Procedures** | **ASK** Let the students know that some states and areas get a lot of sunshine throughout the day. Nevada gets over 290 days of sunshine through year. Many companies are starting to take advantage of the sunny days because the sun provides important things for people, such as light and heat. To test the oven, the students will be attempting to cook a s’more. This can be tested outside or by using a heat lamp. Video: “How To Cook Using The Sun (Mr. Wizard)” (3:05): <https://www.youtube.com/watch?v=AoRR_6cjmkA>Have students Mix-Freeze-Group (<https://www.kaganonline.com/>) to form groups of 3-4 (depending on class size.) Each group is going to create a solar oven to cook a s’more.**IMAGINE** As a class and as a group, have the students discuss what kind of solar oven they would like to make. Discuss the following:What is the problem that they need to solve? (Cooking a s’more)Who has the problem? (The students and teacher)Why is the problem important to solve? (Solar energy is a potentially underutilized form that can be transferred into useful activities such as cooking)**PLAN**Show the students the materials. Each group needs to design a solar oven using: a pizza or rectangular box, pencil, ruler, scissors, aluminum foil, glue, black construction paper, tape, and 1-2 clear sheet protectors or saran wrap. Each group will also receive graham crackers, chocolate bars, and marshmallows.Ask students to observe the pattern of the sun. Ask the students: What time of day do you think would be the best to take the oven outside? Why? What about the season? Do you think it would work better in one season rather than another?**CREATE**Students should use the drawings to make a replica of their oven. Explain to them that scientists often make mistakes, and it is only in these mistakes that we can learn and grow. Students can build their prototypes based on the drawings and make corrections later. Option: Take students through the steps to build an oven.Butter with a side of Bread: Solar S’mores: <https://butterwithasideofbread.com/solar-smores/>Instruct each group: Draw a square on top of the box that’s about 1-2’ smaller than the box itself. Use the scissors to cut along the line on the right, left, and bottom of the box, creating a flap that opens upwards. (Students may need assistance.) Cover the underside of the flap and inside of the box with foil, shiny side out. Keep it as smooth as possible. Glue it down so it doesn’t fall off. Inlay the box with black construction paper, gluing it to the bottom so it stays put. Tape the clear sheet protectors or saran wrap to the lid of the box to seal the opening created by the flap. The seal should be as airtight as possible. Place the oven outdoors in direct sunlight on a hot day. Assemble the s’mores and have a thermometer nearby to check the temperature. Close the lid of the box and prop the flap open with a ruler. Leave the s’mores to “cook” for about 30 minutes. The temperature will be higher the more airtight the oven is. Have the students continue to make observations by writing down the temperature along with the time to see how the cooking is progressing.**IMPROVE**After the s’mores are finished cooking, look at some other structures, including the ones in the Mr. Wizard video. Would a different shape have made a difference? Video: “Cooking with the Sun” (1:53): <https://www.youtube.com/watch?v=NVthiVlIQps>Discuss the questions in the video:* Who do you think could benefit from solar technology?
* What other designs can you come up with?

“Sunshine on my Shoulder: Solar Cooking & Outdoor Kitchen” <http://sunshineonmyshoulder.com/6-homemade-solar-oven-projects-for-kids/>Examine the different designs. Students can then RallyCoach (<https://www.kaganonline.com/>) with another student to see if there are improvements that can be made in their original design, including in their drawing. Place the ovens on a table with most effective to least effective. Have the students identify the characteristics of the more effective structures. Ask the students:* What things helped the ovens cook the s’mores?
* What things were missing from the structures that did not cook the s’more very well?
* Would a different color of paper make a difference?
 |
| **Enrichment** | At this time, materials can be added or taken away. Ask the students: if they had different materials, what else would be added or taken away from the design? How would you make it better?Book: Solar Power (Tales of Invention) by Chris Oxlade, or use myON link: <https://www.myon.com/reader/index.html?a=tlsin_slpwr_f11>  |
| **Closure** | Describe why different structures may have worked better than others, including how the black paper may have absorbed more heat than the white paper, since white reflects the wavelengths of light and absorbs less heat. NASA ClimateKids: Make Sun S’mores! <https://climatekids.nasa.gov/smores/>A solar oven is a box that traps some of the sun’s energy to make the air inside of the box hotter than the outside of the box. In other words, the solar oven is like a super greenhouse. There are lots of ways to make a solar oven. Some ovens have so many reflectors that much more sunlight is directed at the food.  |
| **Assessment** | Students should be graded based on the rubric. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss how the knowledge of the sun’s patterns could help design a solar oven. Student may require assistance in writing or drawing and can be paired up with a student at a higher level.  | Discuss how the knowledge of the sun’s patterns could help design a solar oven. Student may be able to work more independently with teacher support. | Discuss how the knowledge of the sun’s patterns could help design a solar oven. Student may be able to work completely independently, as well as being paired with a student of a lower ability level. |
| **ELL Strategies** |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student discuss how a solar oven works, and why the sun should be studied.*Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore different types of solar ovens. Repeat going over the different objects until they can be repeated and explained. *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. |
| **DOK Question (Level 2)** |
| Ask students: Can you explain how the sun affected the solar oven? Do you think it would work as well if it were cloudy? What about in different areas? |

First Grade Rubric: Engineering

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| **Criteria** | **Exceeds Expectations - 3** | **Meets Expectations - 2** | **Below Expectations - 1** |
| 1-ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted. | Student used observations of the sun to assist with developing their solar oven. | Student somewhat used observations of the sun to assist with developing their solar oven. | Student did not use observations of the sun to assist with developing their solar oven. |
| 1-ESS1-2: Make observations at different times of year to relate the amount of daylight to the time of year.  | Student related observations of the season to how well the solar oven would work. | Student somewhat related observations of the season to how well the solar oven would work. | Student did not relate observations of the season to how well the solar oven would work.  |
| K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. | Student participated with group members to create the model. | Student sometimes participated with group members to create the model. | Student did not participate with group members to create the model. |
| K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. | Student completed the assigned blueprint, including labeling the components. | Student partially completed the assigned blueprint and labeled some components. | Student did not complete the assigned blueprint and did not label the components. |
| K-2-ETS1-3: Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs. | Students compared at least two other designs to their own to make improvements. | Students compared one other design to their own to make improvements. | Students did not compare their design to another. |
| Instructions | Student followed all instructions. | Student followed some instructions. | Student did not follow instructions. |
| Completion | Student completed plan and model. | Student completed some of the plan and/or some of the model. | Student did not complete the plan and/or the model. |
| Effort | Student used best effort and perseverance on the solar oven. | Student used some effort and perseverance on the solar oven. | Student did not show effort or perseverance on the solar oven. |

Points: \_\_\_\_\_\_ / \_\_\_\_\_\_\_= \_\_\_\_\_\_\_\_%

Comments:

Videos and Websites

Merriam-Webster Word Central: <http://www.wordcentral.com/>

Kagan: <https://www.kaganonline.com/>

Education.com: Day sky, night sky: <http://education.abc.net.au/res/i/L20/index.html>

NASA Solar System: <https://solarsystem.nasa.gov/planets/overview/>

“The Solar System Song (with lyrics)” (4:21): <https://www.youtube.com/watch?v=F2prtmPEjOc>

NASA Science: “The Solar System”: <https://spaceplace.nasa.gov/solar-system-explorer/en/#/review/solar-system-explorer/game.swf>

National Geographic Kids: “Planets Memory”: <https://kids.nationalgeographic.com/games/quick-play/planets-memory/>

“Outer Space: “We are the Planets,” The Solar System Song by StoryBots: <https://www.youtube.com/watch?v=ZHAqT4hXnMw>

“Bill Nye The Science Guy on Outerspace (Full Clip)” (2:06): <https://www.youtube.com/watch?v=BdAqq-wEQV0>

“Planets Song Video” (3:48): <https://www.youtube.com/watch?v=noiwY7kQ5NQ>

“The Solar System Song (with lyrics)” (4:21): <https://www.youtube.com/watch?v=F2prtmPEjOc>

BrainPOP jr.: “Solar System” (5:09): <https://jr.brainpop.com/science/space/solarsystem/>

Kids Astronomy.com: “Make a Solar System”: <http://www.kidsastronomy.com/fun/make-a-solar-system.htm>

BrainPOP: “Build a Solar System”: <https://www.brainpop.com/games/buildasolarsystem/>

Turtle Diary: “Solar System Game”: <https://www.turtlediary.com/game/solar-system.html>

Interactive Sites for Education: “Solar System”: <http://interactivesites.weebly.com/solar-system.html>

“Mercury/Planet Mercury/Planet Song for Kids” (2:17): <https://www.youtube.com/watch?v=buPuQ0eDYQM>

“The Planet Mercury Song/Planet Songs for Children/Mercury Song for Kids/Silly School Songs” (3:07): <https://www.youtube.com/watch?v=tbejCiJBZxk>

“Planet Song for Kids/Solar System Song for Children/Venus Song for Kids” (2:00): <https://www.youtube.com/watch?v=w_AK_Fy0h7A>

“The Planet Venus: Astronomy and Space for Kids – FreeSchool” (3:37): <https://www.youtube.com/watch?v=UciCLg8g_4Y>

“The Planet Venus Song/Planet Songs for Children/Venus Song for Kids/Silly School Songs” (2:46): <https://www.youtube.com/watch?v=QwAzyC5i7o0>

“Ready-Jet-Go: Venus”: <http://pbskids.org/video/ready-jet-go/2365652720>

“Earth Facts For Kids/Earth Songs For Kids” (2:24): <https://www.youtube.com/watch?v=gKdxPw9HDUs>

“Outer Space: ‘A Beautiful, Beautiful World,’ The Earth Song by StoryBots” (1:56): <https://www.youtube.com/watch?v=TBmZjOHrVJ0>

Playdough to Plato: Layers of the Earth: <https://www.playdoughtoplato.com/layers-of-the-earth/>

BrainPOP jr.: “Earth” (3:56): <https://jr.brainpop.com/science/space/earth/>

“The Planet Earth Song/Planet Songs for Children/Earth Song for Kids/Silly School Songs” (2:46): <https://www.youtube.com/watch?v=yz7-TADryM0>

Science Games for Kids: “Earth, Sun & Moon”: <http://www.sciencekids.co.nz/gamesactivities/earthsunmoon.html>

“Mars Song/Planet Mars Song for Kids/Mars Song for Kids” (2:05): <https://www.youtube.com/watch?v=ZfBpbRULkOA>

“All About Mars: Astronomy and Space for Kids – FreeSchool” (5:22): <https://www.youtube.com/watch?v=gr7ShbG231U>

PBSparents: Crafts for Kids: DIY Volcano: <http://www.pbs.org/parents/crafts-for-kids/diy-volcano/>

BrainPOP jr.: “Mars” (4:06): <https://jr.brainpop.com/science/space/mars/>

“The Planet Mars Song/Planet Songs for Children/Mars Song for Kids/Silly School Songs” (2:50): <https://www.youtube.com/watch?v=2bWQu9a-f7Q>

“Curiosity Has Landed” (2:30): <https://www.youtube.com/watch?v=N9hXqzkH7YA>

NASA Mars Exploration: <https://mars.nasa.gov/participate/funzone/>

 “Backyardigans Mission to Mars”: <http://www.gamesxl.com/animal/backyardigans-mission-to-mars>

“Jupiter/Jupiter Song for Kids/Planet Songs for Kids/Solar System Songs for Children” (2:30): <https://www.youtube.com/watch?v=zMCDl1Asm_c>

“Why with Nye (Ep. 4): Bill Nye and Jupiter’s Super Storm” (1:53): <https://www.youtube.com/watch?v=GdJlpvwpH6Q>

Steve Spangler Science: Color Changing Milk: <https://www.stevespanglerscience.com/lab/experiments/milk-color-explosion/>

“Amazing milk trick – ‘The Jupiter effect’ – HD” (2:02): <https://www.youtube.com/watch?v=kAQamrSy0Nw>

“The Planet Jupiter Song/Planet Songs for Children/Jupiter Song for Kids/Silly School Songs” (2:56): <https://www.youtube.com/watch?v=Ik_OAH3cL0o>

“Why with Nye (Ep 8): Bill Nye Explains How Jupiter is Like a Blender” (2:57): <https://www.youtube.com/watch?v=mkZPuJySQ5U>

NASA: Juno: <https://www.nasa.gov/mission_pages/juno/main/index.html>

PBS Kids: Ready Jet Go: “Jupiter”: <http://pbskids.org/video/ready-jet-go/2365825226>

NASA Space Place: “JunoQuest”: <https://spaceplace.nasa.gov/junoquest/en/#/review/junoquest/JunoGame.swf>

“Saturn/Saturn Song for Kids/Planet Songs for Kids” (1:53): <https://www.youtube.com/watch?v=LJktwIxAW2I>

“All About Saturn for Children: Astronomy and Space for Kids – FreeSchool” (6:37): <https://www.youtube.com/watch?v=KjZf88aBGe8>

ExpeRimental: “Fizzy bottle rockets”: <http://www.rigb.org/docs/fizzybottlerockets_infosheet_v2_0.pdf>

“Science for kids – How to make fizzy bottle rockets – ExpeRimental #16” (4:43): <https://www.youtube.com/watch?v=z4645B03AC4>

“Explore Saturn’s Rings” (3:38): <https://www.youtube.com/watch?v=BxY8v4lNltM&t=25s>

“The Planet Saturn Song/Planet Songs for Children/Saturn Song for Kids/Silly School Songs” (2:34): <https://www.youtube.com/watch?v=bZzbJJN6exI>

NASA: Cassini: <https://saturn.jpl.nasa.gov/>

PBS Kids: Ready Jet Go: “Saturn”: <http://pbskids.org/video/ready-jet-go/2365724916>

“Planet Song for Kids/Solar System Song for Children/Uranus Song for Children” (2:01): <https://www.youtube.com/watch?v=TQiDAlyAmMQ>

“All About Uranus for Kids: Astronomy and Space for Children – FreeSchool” (5:15): <https://www.youtube.com/watch?v=63KonRAL6CA>

Gift of Curiosity: “Weather science: How to make a cloud in a jar”: <https://www.giftofcuriosity.com/weather-science-how-to-make-a-cloud-in-a-jar/>

The Planet Uranus Song/Planet Songs for Children/Uranus Song for Kids/Silly School Songs” (2:20): <https://www.youtube.com/watch?v=GXrYyXHtWtk>

NASA: Missions: Voyager 2: <https://solarsystem.nasa.gov/missions/voyager-2/in-depth/>

“Planet Uranus, interactive fun game”: <https://www.math4childrenplus.com/uranus/>

“Planet Song for Kids/Solar System Song for Children/Neptune Song for Children” (1:39): <https://www.youtube.com/watch?v=EHBimKW-CMc>

“All About Neptune for Kids: Astronomy and Space for Children – FreeSchool” (5:36): <https://www.youtube.com/watch?v=VM22MyLaRSs>

ScienceNetLinks: Geyser Riser: <http://sciencenetlinks.com/media/filer/2011/09/27/tf-snl-geyser-riser.pdf>

“The Planet Neptune Song/Planet Songs for Children/Neptune Song for Kids/Silly School Songs” (3:09): <https://www.youtube.com/watch?v=5JfAQ5cvrW8>

Space TV: Planet Neptune: <https://www.spacetv.net/neptune/>

“Planet Neptune”: <https://www.math4childrenplus.com/neptune/>

“Outer Space: ‘Time to Shine,’ The Moon Song by StoryBots” (1:58): <https://www.youtube.com/watch?v=i235Y2HRksA&t=6s>

“BrainPOP jr.: Moon” (4:40): <https://jr.brainpop.com/science/space/moon/>

“Where Did the Moon Come From?” (3:49): <https://www.youtube.com/watch?v=b9x5n_uHxMM>

“Bill Nye the Science Guy S01E11 The Moon” (22:59): <https://www.youtube.com/watch?v=lRkcTr9iyeI>

“Moon Phases Song” (3:41): <https://www.youtube.com/watch?v=HkvlrWpsnuQ>

“Why Does the Moon Change?” (3:48): <https://www.youtube.com/watch?v=yXe0yxzYkjo>

4th Grade Frolics: Moon Phases: <http://4thgradefrolics.blogspot.com/2012/05/howling-at-moon-and-happy-happy-joy.html>

“Flocabulary – Moon Phases” (4:46): <https://www.youtube.com/watch?v=xBc8QHSsFgE>

“Moon Phases Demonstration” (4:15): <https://www.youtube.com/watch?v=wz01pTvuMa0>

SoftSchools.com: “Phases of Moon and Sun”: <http://www.softschools.com/science/space/phases_of_moon/>

Science Net Links: “Lunar Cycle Challenge”: <http://sciencenetlinks.com/interactives/moon/moon_challenge/moon_challenge.html>

“The Sun Song/Educational Science Video for Kids” (2:06): <https://www.youtube.com/watch?v=OBnDKfHtcd0>

“The Sun/Educational Video for Kids.” (3:35): <https://www.youtube.com/watch?v=RzkJkEKV8Yk>

True Aim: Light Box Magic: <http://www.trueaimeducation.com/light-box-magic/>

“Liter of Light” (4:40): <https://www.youtube.com/watch?v=iUs-A9GPs8c>

“Bill Nye the Science Guy on Light Bending & Bouncing (Full Clip)” (2:01): <https://www.youtube.com/watch?v=fD1544bM_c4&list=PL0BDDF4F93A8CE664>

“All About the Sun for Kids: Astronomy and Space for Children” (4:56): <https://www.youtube.com/watch?v=VkW54j82e9U&t=32s>

“Sun Facts for Kids!” (10:30): <https://www.youtube.com/watch?v=q-QNPfBQylE>

“Solar System Scope”: <https://www.solarsystemscope.com/>

“Sesame Street – Cookie Monster P.H.D. explains night and day” (1:47): <https://www.youtube.com/watch?v=nzanaJkvQks>

“Scholastic Study Jams! A Day on Earth” (3:50): <http://studyjams.scholastic.com/studyjams/jams/science/solar-system/day-on-earth.htm>

“Shadow/The Dr. Bionics Show/Educational Videos For Kids” (2:48): <https://www.youtube.com/watch?v=lOIGOT88Aqc>

Scholastic: Interactive Science: The Human Sundial: <https://www.scholastic.com/teachers/blog-posts/genia-connell/interactive-science-human-sundial/>

“Following the Sun: Crash Course Kids #8.2” (4:52): <https://www.youtube.com/watch?v=1SN1BOpLZAs>

“Day & night explained” (1:01): <https://www.youtube.com/watch?v=v9J2auAwD_I>

BBC: Light and Shadows: <http://www.bbc.co.uk/bitesize/ks2/science/physical_processes/light_shadows/play/>

“Why Can I See the Moon During The Day?” (3:51): <https://www.youtube.com/watch?v=-Oyv3Qg4a8k>

Sid the Science Kid: Shadow Show: <http://pbskids.org/sid/shadowshow.html>

Duckie Deck: “Day and Night”: <http://duckiedeck.com/play/day-and-night>

“Seasons and the Sun: Crash Course Kids 11.1” (3:56): <https://www.youtube.com/watch?v=b25g4nZTHvM>

“Why Are There Seasons?” (2:20): <https://www.youtube.com/watch?v=UQjT5uKp2hg>

“Astronomy 4 Kids: (short) ACTIVITY – An effect of Earth’s tilt, the seasons” (1:05): <https://www.youtube.com/watch?v=IFSsZ2Q3TAg>

“Bill Nye explains Seasons” (4:45): <https://www.youtube.com/watch?v=KUU7IyfR34o&t=72s>

“Bill Nye the Science Guy S01E15 Seasons” (22:57): <https://www.youtube.com/watch?v=Jp21OUKsbgU>

TurtleDiary: “Seasons – Weather Game”: <https://www.turtlediary.com/game/seasons.html>

Vegas PBS LearningMedia: “Why Do We Have Seasons?”: <http://d3tt741pwxqwm0.cloudfront.net/WGBH/npls13/npls13_int_seasons/index.html>

“Outer Space: ‘I’m A Star,’ The Stars Song by StoryBots” (1:46): <https://www.youtube.com/watch?v=7t3aXb3LpWg&t=15s>

“Constellations: Connect the Dots in the Sky!” (3:44): <https://www.youtube.com/watch?v=1sZ15SUeS9w>

Education.com: Make Window Constellations: <https://www.education.com/activity/article/window_constellations_first/>

“Super Stars (Constellations): Crash Course Kids #31.1” (4:58): <https://www.youtube.com/watch?v=MZffhapfOgg>

“Lin-Manuel Miranda, Opetaia Foa’I – We Know The Way (From Moana)” (2:35): <https://www.youtube.com/watch?v=ubZrAmRxy_M>

“What Are Stars?” (3:38): <https://www.youtube.com/watch?v=ZrS3Ye8p61Y>

“Stars for Kids/Stellar Evolution for Kids/Evolution of a Star” (3:53): <https://www.youtube.com/watch?v=fgqnh_6cCE4&t=42s>

DKfindout!: Constellations: <https://www.dkfindout.com/us/space/constellations/>

“Bill Nye The Science Guy on Outerspace (Full Clip)” (2:06): <https://www.youtube.com/watch?v=BdAqq-wEQV0&list=PLSvZ2UyLg63puV1ULdmPRCnE_ngxSVbyC>

PBS Kids: Constellations: <http://pbskids.org/readyjetgo/games/mindy/index.html>

KidsAstronomy.com: Constellation Hunt: <http://www.kidsastronomy.com/astroskymap/constellation_hunt.swf>

“Sesame Street – ‘Planets, Moon and Stars (CGI version)” (1:16): <https://www.youtube.com/watch?v=88jFV8jguW4>

“How to Make a Comet in Your Kitchen” (2:41): <https://www.youtube.com/watch?v=IIaKvb7UleE>

“Comets and Asteroids!” (4:00): <https://www.youtube.com/watch?v=02wrLS-ue1Q>

“The Asteroid Belt Song/Asteroid Belt Song for Kids/Asteroid Belt Facts/Silly School Songs” (2:32): <https://www.youtube.com/watch?v=iLFqJm_V2Jw>

“Pluto Song for Kids/Pluto Facts/The Pluto Song/Silly School Songs” (3:10): <https://www.youtube.com/watch?v=P5ipVlY5p7w>

“Bill Nye the Science Guy S05E15 Comets and Meteors” (22:56): <https://www.youtube.com/watch?v=uoLCzpbpaOY>

NASA Space Place: “Tails of Wonder”: <https://spaceplace.nasa.gov/tails-of-wonder/en/#/review/tails-of-wonder/preloader.swf?path=/review/tails-of-wonder/stardust>

“Planet Impact”: <http://amazingspace.org/resources/explorations/impact/home.html>

PBS Kids: Ready Jet Go!: “Sydney’s Astro-Tracker”: <http://pbskids.org/readyjetgo/games/astro/index.html>

“Solar System/Solar System Song/Planets Song for Kids/8 Planets” (3:08): <https://www.youtube.com/watch?v=mQrlgH97v94>

“Solar System 101/National Geographic” (4:10): <https://www.youtube.com/watch?v=libKVRa01L8>

E is for EXPLORE! Candy Solar System: <http://eisforexplore.blogspot.com/2012/04/candy-solar-systems.html>

“Learning About The Planets in Our Solar System” (20:01): <https://www.youtube.com/watch?v=jEXWxNbpTzU>

Education and Public Outreach: “Planet Size Comparison”: <http://www.messenger-education.org/Interactives/ANIMATIONS/Planet_Size_Comparison/planet_size_comp.php>

Solar System: Identify Planets: <http://www.softschools.com/science/space/solar_system_kids_games/>

National Geographic Kids: “Planets Memory”: <https://kids.nationalgeographic.com/games/quick-play/planets-memory/>

“Sesame Street: Kermit’s Weather Calendar” (5:13): <https://www.youtube.com/watch?v=8dAp78XJUsQ&t=18s>

The Weather Channel: <https://weather.com/>

Time and Date: <https://www.timeanddate.com/sun/usa>

Vegas PBS: “Observe Sunrise and Sunset” (1:06): <https://vegas.pbslearningmedia.org/resource/ess05.sci.ess.eiu.riseset/observe-sunrise-and-sunset/#.Wtd6f4jwaUk>

Moon Giant: <https://www.moongiant.com/phase/today/>

“Learning About The Moon and Its Phases” (6:44): <https://www.youtube.com/watch?v=UhhSmpFtg7k&t=63s>

“Constellation Location: Crash Course Kids #31.2” (3:48): <https://www.youtube.com/watch?v=BbzCA0Lgf3Y&t=149s>

Match the Memory: “Phases of the Moon Matching Game”: <https://matchthememory.com/BESLclass>

Harcourt School: “Phases of the Moon”: <http://www.harcourtschool.com/activity/science_up_close/210/deploy/interface.swf>

Kids Astronomy: <http://www.kidsastronomy.com/>

Planets For Kids: <http://www.planetsforkids.org/>

NASA Science: Solar System Exploration: <https://solarsystem.nasa.gov/solar-system/our-solar-system/overview/>

The 8 Planets Just for Kids: <http://kids.nineplanets.org/>

ESA Kids: Our Universe: <http://www.esa.int/esaKIDSen/OurUniverse.html>

Easy Science for Kids: Solar System – The Sun and Planets: <http://easyscienceforkids.com/all-about-the-solar-system/>

NASA Space Place: <https://spaceplace.nasa.gov/>

Software Applications (Apps)

“Solar Walk Lite: Planetarium 3D” – Planetary System Encyclopedia

 “The Solar System by BabyBus” – BABYBUS

 “Interactive Minds: Solar System – Lite” – Vosonos LLC

“Solar Walk 2 Ads+: Planetarium” – Solar System Encyclopedia 3D

“Space Images” – Jet Propulsion Laboratory

“Solar System: All About Space” – Sasi Dharani KM

“My Solar System” – Alexander Skalov

“Solar System Journey – School Edition” – John Rouda

“Solar System – HD” – Magicbox Animation Private limited

“Earth 3D” – SOLILAB

 “3D Earth – weather forecast” – widget, rain alerts & maps

 “MeteoEarth” – MeteoGroph Deutschland GmbH

“Mars Globe” – Midnight Martian

“Midnight Planes” – Midnight Martian

“Mars Walk” – Lockheed Martin

“Jupiter Moon Tracker” – James Li

“Jupiter Simulator” – Yeudy Blanco

“Cassini-Huygens Mission to Saturn” – University of Colorado Boulder

“Voyager: Grand Tour” – Rumor Games, LLC

“Gas Giants” – Software Bisque

“Find Pluto – and Other Planes” – Paul Young

“Size the Solar System” – Justin Hughes

“Spacecraft 3D” – Jet Propulsion Laboratory

“Moon Globe” – Midnight Martian

“Luna: Sun, Earth, and Moon” – Orkhan Nadirli

“Grandpa Benny flies to the moon” – The Voice Of Reason LTD

“MOON – Current Moon Phase” - Charlie Deets

“My Moon Phase – Lunar Calendar” – Full Moon Phases & Moon Alerts

“xSky” – xSKy Inc

“Solar Vision” – Space Science Institute

“Day & Night Map” – Volker Voecking Software Engineering

“M65 Seasons” – VINCI Education Corporation

“Dark Side of the Earth” – Dargan M. Frierson

“Night Sky” – AR Guide To The Sky Above

“Star Chart” – Escape Velocity Limited

“StarTracker Lite – Mobile SkyMap” – Planetarium for astronomy fans

“OSR Star Finder” – DTT Multimedia B.V.

“Comet ISON” – Wobbleworks LLC

“Comets – Snowballs from Outer Space” – John Kennedy

“Meteors and Meteorites” – John Kennedy

“Galaxeon Space Asteroid Arcade” – Croma Produccions Multimedia SL

“NASA” – NASA

“Solar Walk Ads+: Explore Space” – Astronomy, Stars and Planets

“solar System Augmented Reality” – Walk around the planets in AR!

“Sunrise Sunset Times” – Local Sun Rise and Set Time

“The Sun: Sunrise sunset times” – Calendar sunrise sunset

“Sunrise – Moon Phase” – AVIA

“Moon Phase Plus” – The Full Moon Phases Calendar

“Moon Phases and Lunar Calendar” – Full Moon Phase

“SimpleMoon – See the Moon Phase” – Tag Along K

“Solar System Scope” – INOVE, s.r.o.

“Planetarium Zen Solar System” – Ghulam Jewel