Unit Title: Earth's Place in the Universe	**Content Area:** Earth's System Science	**Grade Level:** 4

Unit Summary: In this unit, students will investigate The History of Planet Earth to discover that local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. The unit concludes with a look into fossils and evidence of environmental changes in the history of the Earth.
The Universe and its Stars:
Students will understand that the sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth.
Earth and the Solar System:
Students make long-term observations of the position of the sun and moon in the sky to develop an understanding of relative distances, the appearance of movement across the sky, and relate it to day and night, Earth's orbit, the spin of the Earth, and the visible shape of the moon.
The orbits of Earth around the sun, and of the moon around Earth, cause observable patterns. Students will record data to understand patterns of objects in the universe. They will explore the ways in which Earth is a part of the all-encompassing system of the universe. They will study how under the influence of gravitational forces, the solar system has developed its organizational patterns, and the patterns of movement of its component celestial bodies. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. The Science and Engineering Practices in this unit are Analyzing and Interpreting Data, Asking Questions, Developing and Using Models, Constructing Explanations, Planning and carrying out investigations, Obtaining, Evaluating, communicating information, and Engaging in Argument from Evidence.
The cross cutting concepts are "Patterns, Scale, Proportion, and Quantity.

Unit Essential Questions:	**Unit Enduring Understandings:**
• To what extent are the properties of objects in our solar system predictable? • What causes these patterns? • How do geologic events occurring today provide insight Earth's past?	• Observable, predictable patterns in the solar system occur because of gravitational interactions and energy from the Sun. • Earth's components form systems. These systems continually interact at different rates of time, affecting the shape of the Earth's surface regionally and globally.

Possible Student Misconceptions:

- Stars and constellations appear in the same place in the sky every night.
- The sun rises exactly in the east and sets exactly in the west every day.
- The sun is always directly south at 12:00 noon.
- We experience seasons because of the earth's changing distance from the sun (closer in the summer, farther in the winter).
- The earth is the center of the solar system. (The planets, sun and moon revolve around the earth.)
- The moon does not rotate on its axis as it revolves around the earth.
- The phases of the moon are caused by shadows cast on its surface by other objects in the solar system.
- The phases of the moon are caused by the shadow of the earth on the moon.
- The phases of the moon are caused by the moon moving into the sun's shadow.
- Meteors are falling stars.
- Comets and meteors are out in space and do not reach the ground.
- The surface of the sun is without visible features.
- All the stars are the same distance from the earth.
- The galaxy is very crowded.
- Stars are evenly distributed throughout the universe.
- The brightness of a star depends only on its distance from the earth.
- The constellations form patterns clearly resembling people, animals or objects.

NJCCCS: 5.4.4.A.1, 5.4.4.A.2, 5.4.4.A.3, 5.4.4.A.4, 5.4.4.B.1

NGSS Performance Expectations: *Students who demonstrate understanding can…*

- 4-ESS1-1 Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time.]
- 5-ESS1-1. Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth.
- 5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Primary CCSS ELA/Literacy Connections: W.4.7 ,W.4.8 ,W.4.9,RI.5.1 ,RI.5.7 ,RI.5.8,RI.5.9 ,W.5.1	**Primary CCSS Mathematics Connections:** MP.2 , MP.4,4.MD.A.1,MP.2 , MP.4 ,5.NBT.A.2 ,5.G.A.2

SL.5.5

Lesson Pace & Sequence

Lesson Title/Number: Rocks Really Rock! #1	**Learning Objective(s):** Students will determine which of their rocks is hard (it scratches glass) and which is soft (it can be scratched by a fingernail, a penny, or a paper clip) by using the recorded results on the matrix. Students will classify their rocks according to whether or not the rocks leave a streak. Students will classify their rocks according to the presence or absence of carbonate using their recorded results on the matrix.	**Lesson Duration:** 75 Minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students love to collect rocks (or objects that look like rocks), so before the students participate in this investigation, give students a homework assignment to participate in a rock scavenger hunt on or off the school grounds. They will hunt for a large rock, a small rock, a pretty rock, an unusual rock, and a rock with two or more colors. They will place their rocks in a paper or plastic bag as they collect them. Note for teacher: if you have access to rock collections, bringing them into the class through the unit will expose the students to various types of rocks, minerals, and gems.	Advanced Preparation (Have materials ready for groups in a central location, when needed, are easily accessible) • Selected rocks: talc, granite, marble, agate, etc. • Pencil and paper • Penny • Paper clip • Small paper cups • Piece of glass or mirror • Chalk • Vinegar • Paper or plastic bag • Access to a concrete sidewalk • Eyedropper • Masking tape	Developing and Using Models Develop a model using an example to describe a scientific principle. (5-ESS2-1)	ESS1.C: The History of Planet Earth Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)	

Explore: What hands-on/minds-on common experience(s) will you provide for students?	1. When students have returned to the classroom, they will label each of their rocks #1–#5 using the masking tape. 2. Working either individually or in pairs, students will perform the following tests: *Students will attempt to scratch each of their rocks using a fingernail, a penny, and a straightened paper clip. Also, they will attempt to scratch the glass with each rock. They will indicate their results on the matrix using yes or no. *Students will stroke each of their rocks across a concrete sidewalk in an attempt to see their rocks' streak. Streak is the color of a mineral's powder. Rocks will streak only if stroked across a surface harder than itself. *To test for the presence of carbonate, distribute a piece of chalk and a small cup of vinegar to each student. Using an eye dropper, the student will drip a small amount of vinegar on the chalk and observe the results (a small amount of fizz). The student will repeat the procedure on each of his/her rocks and record the results on the matrix.	• Matrix for Recording information and observations	Obtaining, Evaluating, and Communicating Information Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2), (4-ESS3-1) Developing and Using Models Develop a model using an example to describe a scientific principle. (5-ESS2-1) Constructing Explanations and Designing Solutions Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	ESS1.C: The History of Planet Earth Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)	Patterns: Patterns can be used as evidence to support an explanation. (4-ESS1-1), (4-ESS2-2) Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems Science assumes consistent patterns in natural systems. (4-ESS1-1)

Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Students will determine which of their rocks is hard (it scratches glass) and which is soft (it can be scratched by a fingernail, a penny, or a paper clip) by using the recorded results on the matrix. Students will classify their rocks according to whether or not the rocks leave a streak. Students will classify their rocks according to the presence or absence of carbonate using their recorded results on the matrix.	• Matrix Completion and Participation in group work			
Lesson Title/Number: Classifying Rocks #2	**Learning Objective(s):** Students study and observe rocks and identify properties that can be used to classify or divide the rocks into groups. Students then identify other properties that could be used to classify or divide other objects into groups.			**Lesson Duration:** 45-50 Minutes	
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	How do scientists classify rocks? What did you learn from the previous activity? Is there a method for easily classifying rocks, minerals, etc.	Advanced Preparation (Have materials ready for groups in a central location, when needed, are easily accessible) • A set of 12 to 15 rocks, of various kinds, sizes, etc. • Hand lens • Pen or pencil • Classifying Rocks (PALS): http://pals.sri.com/tasks/k-4/Rocks/directs.html	Asking Questions & Defining a Problem	ESS1.C: The History of Planet Earth Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)	Systems and System Models

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Think about a property of the rocks. Then think about the opposite conditions of that property. The first property you will use is size. The opposite conditions of that property are "large" and "small." Sort your rocks by putting large ones in one pile, and small ones in another pile. The differences do not need to be very great, but you and your partners have to decide. When you have grouped them, count the number in each group and enter the number on your Data Sheet. Following, you will determine other properties of the rock samples that have opposite conditions (i.e. smooth/rough) which you can use to divide the rocks into two groups. If your rocks do not fit into the 2 groups, place them in a 3rd pile. This will continue until you have not come up with anymore properties.	• Data Sheet • Pen or pencil	Obtaining, Evaluating, and Communicating Information Constructing Explanations and Designing Solutions	ESS1.C: The History of Planet Earth Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)	Systems and System Models Patterns
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Teachers may decide to have the students share first before the independent assessment, so that students gain access to communicating their findings.		Obtaining, Evaluating, and Communicating Information Constructing Explanations and Designing Solutions Analyzing and Interpreting Data		Systems and System Models Patterns

Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Students complete an assessment where they will look at four objects drawn on a sheet of paper. They will have to find 3 properties and opposite conditions.	• Task Rubric	Obtaining, Evaluating, and Communicating Information Constructing Explanations and Designing Solutions Analyzing and Interpreting Data		Systems and System Models Patterns
Extend: How will students deepen their conceptual understanding through use in new context?	Students are then asked to classify groceries in a store. Students make a table that gives some properties with opposite conditions just like they did in the original investigation.	• Completion of Table • Task Rubric	Constructing Explanations and Designing Solutions Analyzing and Interpreting Data		Systems and System Models Patterns
Lesson Title/Number: Rock Discovery (Rock Cycle)		**Learning Objective(s):** Identify igneous, sedimentary, and metamorphic rock through discovering and examining rock characteristics and processes.			**Lesson Duration:** 100 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***

Elicit: How will you access students' prior knowledge?	Gauge the students' current knowledge on the three types of rocks after the previous lessons. Be sure the students have some background knowledge of these types through Reading Selections, Videos, or Read Alouds. (Several Suggestions are in "Resources/Materials" section)	Books: • Geology Rocks by Cindy Blobaum (Williamson Publishing Co.), 1999 • Rocks and Minerals Alfred A. Knof, Inc. (Eyewitness Books), 1988 • Rocks and Soil by R. Sneddon (Raintree Steck-Vaughn Company), 1999 • Rocks and Minerals Reader's Digest Children's Publishing, Inc. (Weldon Own, Inc.), 1999 Videos: • Eyewitness Rocks and Minerals; Item #1234 OR ISBN 1234567890 • Bill Nye the Science Guy-Erosion Websites: • Classifying Rocks - Background Info Sheet: http://www.uen.org/Lessonplan/downloadFile.cgi?file=9852-2-14033-classify_rocks.pdf&filename=classify_rocks.pdf • How Rocks are Made - Background Info Sheet: http://www.uen.org/Lessonplan/downloadFile.cgi?file=9852-2-14034-how_rocks_are_made.pdf&filename=how_rocks_are_made.pdf	Asking Questions	ESS1.C: The History of Planet Earth Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)	Connections to Nature of Science

Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	What do you think a rock cycle might look like? Have students draw their ideas of what it might be and share as a class. Students put together their printable magnifying glass including terms and definitions that relate to the rock cycle. Students try to find the appropriate matches of term and definition. Gather student ideas, and have them self check during the discussion.	• Sheet of Paper for each student • Printable Magnifying glass	Asking Questions & Defining Problems Developing Models Engaging in Argument through Evidence	ESS1.C: The History of Planet Earth	
	Students examine the printable "Rock Formations" with no labels on it. Students compare this to their rock cycle previously drawn at the beginning of the lesson. At this point students should look for similarities, differences. Have the students come up with sentences/phrases/questions about what is going on. Students are looking for the three main processes in the rock cycle utilizing their Printable "Take a Closer Look" vocabulary and previously gained knowledge to describe what's happening. Students place labels where they think is appropriate (Students may revise their ideas later on).	• Rock Discovery Lesson Plan: http://www.uen.org/Lessonplan/preview.cgi?LPid=16293 • Take a Closer Look Handout: http://www.uen.org/Lessonplan/downloadFile.cgi?file=16293-2-22420-take_a_closer_look.pdf&filename=take_a_closer_look.pdf • Rock Formations Handout http://www.uen.org/Lessonplan/downloadFile.cgi?file=16293-2-22419-rock_formations.pdf&filename=rock_formations.pdf	Obtaining, Evaluating, and Communicating Information Developing and Using Models Constructing Explanations and Designing Solutions	ESS1.C: The History of Planet Earth	Structure and Function Patterns
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Give each table a set of rocks. Students use hand lenses to spend some time observing. Students devise ideas as to how those particular rocks came to be that way.	• Various Rock samples • Hand lens for each pair or group	Planning & Carrying Out Investigations	ESS1.C: The History of Planet Earth	Structure & Function

Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students review or are introduced to the basic types of rocks using the Reference Sheet or Cards, "What's This Rock?" Looking at the descriptions and their names, students go back to their original labels and revise their ideas to reflect the current knowledge.	• What's This Rock Reference Sheet: http://www.uen.org/Lessonplan/downloadFile.cgi?file=16293-2-22422-what_s_this_rock_reference.pdf&filename=what_s_this_rock_reference.pdf • What's This Rock? Cards: http://www.uen.org/Lessonplan/downloadFile.cgi?file=16293-2-22421-what_s_this_rock_cards.pdf&filename=what_s_this_rock_cards.pdf	Construct Explanations	ESS1.C: The History of Planet Earth	
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	To assist with expanding on their understanding of the process of a rock cycle and different types of rock, students will use taffy to demonstrate the processes. Each student receives 3 different colors of taffy pieces. Sedimentary: students flatten out each color, and then lay them on top of each other to demonstrate the layering. Metamorphic: Take taffy and twist and fold it to show how the heat and pressure works on rocks inside the earth. Igneous: Place the taffy inside your hand or under your arms to represent melting. To enhance their learning of the types of rocks: Students may sing the Rock Cycle Song.	• Solid Color Taffy	Developing Models Engaging in Argument through evidence	ESS1.C: The History of Planet Earth	Systems & System Models

Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Students evaluate their Rock cycle Graphic so that students can self-check and discuss what they have learned in this lesson. Using the Rock Field Guide Template, students may choose one or several of the rocks to illustrate and describe.	• Rock Formations Handout • Magnifying Glass Handout • Rock Field Guide: http://www.uen.org/Lessonplan/downloadFile.cgi?file=16293-2-22418-rock_field_guide_and_song.pdf&filename=rock_field_guide_and_song.pdf	Obtaining, Evaluating and Communicating Information.	ESS1.C: The History of Planet Earth	
Lesson Title/Number: Fossil Puzzler	**Learning Objective(s):** Students will gain an understanding of how scientists use trace fossils to construct a model of an unknown creature and infer information about the creature.				**Lesson Duration:** 100 Minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***

Elicit: How will you access students' prior knowledge?	Introduce the concept of fossils by showing images of fossilized shells, bones, tracks, etc. Photos and Videos of fossils can be found online, and most libraries will have books about fossils. Students will probably be familiar with dinosaur fossils, but provide examples of other types of fossils such as shells and footprints. Explain to students the difference between body fossils and trace fossils. Body fossils contain the preserved remains of the original organism such as bones, teeth, wood, and shells. Trace fossils include all preserved items that were not part of the organism's body, such as imprinted tracks, eggshells, feces, burrows and so on. Use dinosaurs as an example to illustrate the point. A dinosaur body fossil is a bone that belonged to the skeleton of the dinosaur, and a dinosaur trace fossil is a footprint that was made while the dinosaur was walking in mud.	Materials Needed for Each Team: • Modeling clay • One oddly shaped doll Materials needed for Activity: • Set of three clay fossil imprints • Pencils or pens • Large paper Teacher Prep: Obtain a doll with a unique body structure such as a fictional animal or alien of some sort. Break off small mounds of modeling clay so that each group will have 3 different "fossil imprints" of a part of the doll that isn't giving away the part of the doll it is. (See Teacher Preparation for full details) • Fossil Tour Video: http://www.ucmp.berkeley.edu/education/explorations/tours/fossil/5to8/Intro.html		ESS1.C: The History of Planet Earth	Structure and Function

Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Remind students that most dinosaur skeletons that we see in museums today are made up only partly of actual fossil bones. The rest of the skeleton is made of model bones. Have a discussion about how scientists make observations and measurements of dinosaur footprints (trace fossils) to construct the models of dinosaur feet we see in museums. Talk about how they might do this; in other words, what information can be learned by examining the imprints? Students should identify features such as shape, size, and possibly texture.		Obtaining, Evaluating and Communicating Information	ESS1.C: The History of Planet Earth	Structure and Function Patterns
Explore: What hands-on/minds-on common experience(s) will you provide for students?	1. Separate students into groups of two to four students. Distribute sets of three clay fossil imprints. Distribute pencils and Student Handouts. 2. Ask students to examine the clay and determine which types of fossils these are. They should realize that these are trace fossils because they are imprints of a creature. Have students examine the size, shape, and texture of the fossils. 3. Have students draw each fossil on their Student Handouts. Encourage groups to discuss what type of body part they think each fossil represents. Have students discuss and draw what type of animal the fossils might compose. 4. After each group has examined and made drawings of their set of fossils, have them swap sets with another group. Tell them to	• Paper to Sketch Fossil Imprint • Pencils • Fossil Imprints	Obtaining, Evaluating and Communicating Information Developing & Using Models Planning and Carrying Out Investigations Engaging in Argument from Evidence	ESS1.C: The History of Planet Earth	Structure and Function Patterns

	repeat the process of observation, drawing, and discussion with the new set. Have students draw a revised version of the creature based on these new fossils. 5. Ask students to discuss how fossils from different sets might offer different or additional clues. Do the new fossils represent new parts of the creature's body or the same parts that they have seen only imprinted from a different angle? How does this new information change their vision of the "mystery creature"? 6. Have students continue to swap fossils until each group has sketched all fossils. Then have groups decide on a final version of the creature that they think created the fossils. Groups should sketch a front, back, and side view of the creature on a large piece of paper. Have students hang up these drawings on the board when they are finished.				

Explain: How will you help students connect their exploration to the concept/topic under investigation?	Lead a class discussion about the similarities and differences between each group's final sketches of the creature. Ask students how they decided which part of the creature's body each fossil represented, and how they ultimately decided what creature the fossils composed. What assumptions did they make? For example, maybe the fossil showed rounded toes with claws so students decided the fossil was a paw print. If they thought the fossil was a paw, how did this help them identify the larger animal? Did they assume it was an animal with fur, such as a dog or a cat? Show the class the original object (doll) that imprinted the fossils. Discuss and compare their drawings with the actual creature.				
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Written Assessment As exit slip	• Student Handout: Fossil Puzzler	Obtaining, Evaluating and Communicating Information	ESS1.C: The History of Planet Earth	Structure and function
Extend: How will students deepen their conceptual understanding through use in new context?	Have students create their own fossil by making an imprint of their fingers, (or at the discretion of the teacher other parts such as noses, toes, etc.) or other small objects. Then they switch with another student in the class to examine and determine the object left in the imprint.	• Modeling clay • Small objects (coins, toothpicks, paperclips)	Developing & Using Models Constructing Explanations and Designing Solutions	ESS1.C: The History of Planet Earth	Structure and function
Lesson Title/Number: Solar System Scale	**Learning Objective(s):** Students will gain an understanding of the comparative size of the objects in our Solar System and the great distances between them.				**Lesson Duration:** 100 Minutes

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	A pre-assessment may be used to evaluate the students' current knowledge base of the planets in the solar system. The Video on the Lesson Plan Webpage is suggested to be viewed as a background for the teacher.	• Solar System Scale Activity: http://www.siemensscienceday.com/activities/solarsystemscale.cfm • Solar System Scale Handout: http://www.siemensscienceday.com/pdf/SolarSystemScale.pdf		ESS1.A: The Universe and its Stars The sun is s star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1) ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	Patterns can be used as evidence to support an explanation.

Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	• Read through the vocabulary words and ask the students for definitions. (See Warm-Up on linked file) • Ask the students to name as many planets as they can. • Write the student responses on the chart paper/chalkboard or interactive whiteboard. • Ask the students to name them in order from the sun. • Write their responses down. • Introduce the students to the pneumonic device, My Very Excellent Mother Just Served Us Nine Pizzas. (or any version you or the students can come up with; also optional to include the dwarf planet Pluto) • Rewrite the planets in the correct order if any were out of place. • On a chalkboard or interactive whiteboard draw two columns and label one rock and the other gas. Ask the students to sort the planets to determine which are made of rock and which are made of gas. • Ask them what each type has in common. • Explain terrestrial and Jovian planets. • After brief discussion, give each student the construction paper and have them individually draw or name the planets in order.		Obtaining, Evaluating, and Communicating Information Obtain and combine information from books and other reliable media to explain phenomena.	ESS1.A: The Universe and its Stars The sun is s star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1) ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.

Explore: What hands-on/minds-on common experience(s) will you provide for students?	Part 1: 1. Tell the students they will be building a model of our Solar System that shows the relative size of the objects. 2. Start with the sun. Tell the students it is too large to be included on their model. Tell them they will represent the sun. 3. Hand the class the plates that contain the edible materials for them to make the Solar System. Frosting may be used in small amounts to hold the smaller planets on the plates. 4. Begin with Mercury. Ask them which item on their plate they think will represent Mercury. 5. Instruct them to paste the piece on one side of the plate. Mercury- sprinkles Venus -small marshmallows Earth-small marshmallows Mars -candy coated chocolate pieces Jupiter- apples Saturn - tangerines or small oranges Uranus - grapes or cherries Neptune- grapes or cherries 6.Repeat the process through all the planets. Use the discussion points about the planets, below, as you go through the activity. 7. When you have finished all the planets explain that they will now move on to the distance activity.	Part 1: Planet comparison activity: • chart paper • marker • 1 can of white frosting • 1 small container of sprinkles • 1 bag candy coated chocolate pieces • 1 bag small marshmallows (marble sized) • apples, 1 for every student • tangerines or small oranges, 1 for every student • grapes or cherries • 1 plate per student. • construction paper, 1 sheet per student	Developing and Using Models Obtaining, Evaluating and Communicating Information Planning and Carrying Out an Investigation	ESS1.A: The Universe and its Stars The sun is s star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1) ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.
	Part 2: 1. If you are able to go outside, choose a location where you will have ample space. Take the stakes and hammer with you. If you are staying indoors, a hallway will do but you will be limited in the	Part 2: Planet distance activity: • 1 set of Solar System posters that are labeled with each planet's name • 1 yellow balloon • colored pencils or crayons for each student • 9 stakes or sign holders (total)	Developing and Using Models Obtaining, Evaluating and Communicating Information Planning and Carrying Out an	ESS1.A: The Universe and its Stars The sun is s star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1)	Patterns can be used as evidence to support an explanation. Systems and System Models

	number of planets that you can visit during your walk. For the Planet distance activity the instructors will need to familiarize themselves with the actual distances between objects in our Solar System. Place the balloon at the start of your walk. For a sun with a 17 cm diameter the scale is 1m: 7,828,965km. Using the solar system data below, the sun (balloon) will have a diameter of approximately 17cm or 7 inches. (SEE Solar System Data Information) Linked Lesson Attached 2. Place the sun at your starting location. 3. Ask the class where they think the first planet should be as you walk from the sun. Have the students measure 24 feet from the sun. When you reach 24 feet from the sun place the Mercury poster. 4. Continue with the pattern until you run out of space or reach Neptune. If you stop early ask the students how much farther they think the other planets will be. Explain that Pluto is a dwarf planet and that it is so far away that if they traveled to Uranus they would only be halfway to Pluto. 5. When you return to the room, continue on to the wrap-up activity.	• tape • 1 hammer • tape measure, yard stick or meter stick	Investigation	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	A system can be described in terms of its components and their interactions. Scale, Proportion, and Quantity

Explain: How will you help students connect their exploration to the concept/topic under investigation?	Lead the students in a discussion about scale models. Ask them if they have any models in their homes. Mention train sets, model airplanes and ships, or maps. Remind them that scale models are used to represent or demonstrate great size or distance on a smaller, more easily understood scale. Ask them why we would want to use scale when talking about the Solar System.	• Solar System Scale Handout: http://www.siemensscienceday.com/pdf/SolarSystemScale.pdf	Developing & Using Models		
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Create a Distance Data Table with the class measuring kilometers, Miles, and AU's, based on what they gathered from the activities.	• Solar System Scale Handout: http://www.siemensscienceday.com/pdf/SolarSystemScale.pdf	Analyzing and Interpreting Data Constructing Explanations	ESS1.A: The Universe and its Stars ESS1.B Earth and the Solar System	Scale, Proportion and Quantity Patterns
Extend: How will students deepen their conceptual understanding through use in new context?	Students can then create a mathematical word problem using the data from the table created and exchange with peers.	• Solar System Scale Handout: http://www.siemensscienceday.com/pdf/SolarSystemScale.pdf	Using Mathematics and Computational Thinking	ESS1.A: The Universe and its Stars ESS1.B Earth and the Solar System	Scale, Proportion and Quantity Patterns
Lesson Title/Number: Shadows	**Learning Objective(s):** Describe the motion of the Sun based on shadow observations. Explain how shadows could be used to tell the time of day.				**Lesson Duration:** 90 minutes
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***

Elicit: How will you access students' prior knowledge?	Allow students to respond in their journals "Where is the Sun at noon?" Let students write at least 2 questions they have about shadows.	• Classroom Activities: http://mcdonaldobservatory.org/teachers/classroom	Asking Questions	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Before going outside, allow students to predict/draw what their shadows would look like.	• Notebooks	Asking Questions	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.
Explore: What hands-on/minds-on common experience(s) will you provide for students?	One member is to play "statue" — holding still while the other team members trace the outlines of both the statue's feet and shadow on the pavement or paper. When all the tracings are completed, the entire class can examine them. Wait about 30–60 minutes, then ask the "statues" to return to their places (which is why they traced their feet) and hold the same position again.	• Chalk • Outdoor drawing are • Lamp • Action figure and flashlight for each team of students	Developing and Using Models Obtaining, Evaluating and Communicating Information Planning and Carrying Out an Investigation	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.

Explain: How will you help students connect their exploration to the concept/topic under investigation?	Guide students in discussing results of what changed. Ask them to predict where the shadow will be in three hours. Guide students to discuss how Day and Night pattern is caused.		Communicating information.	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students build sundials and observe changes in shadows over the course of one or more days. Students identify patterns in the shadows and discuss how shadows may be used to tell time.	• Sundials - Observing and Using Shadows: http://www.eyeonthesky.org/lessonplans/14sun_sundials.html	Developing and using Models	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Students measure length of shadows. They can create a graph of length versus Time of day. Students use graph to explain motion of sun based on shadows.	• Notebooks • Rulers or measuring tape	Mathematical and computational thinking	" ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. "	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.

Extend: How will students deepen their conceptual understanding through use in new context?	How could you change the shadow of an object? Here are some objects you can use for your investigation: hula hoops, a circle of cardboard, and a pencil. Feel free to use other objects. Record your observations. 2. Write a poem about your shadow.	• Me and My Shadow: http://www.cfep.uci.edu/cspi/docs/lessons_elementary/Me%20and%20My%20Shadow.pdf	Developing and Using Models. Constructing Explanations	" ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. "	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.
Lesson Title/Number: The Sun and Earth	**Learning Objective(s):** Explain how Earth's rotation causes Day and Night. Why the Sun's apparent motion in the sky differs from season to season.				**Lesson Duration:**
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	What we can see in the sky and why the sun appears to move the way that it does.	• Phases of the Moon Lesson Plan: http://www.brainpop.com/educators/community/lesson-plan/phases-of-the-moon-lesson-plan-position-of-the-planets/	Asking Questions	" ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. "	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "

Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Guide students to discuss Sun. Allow students to draw their model showing how they think the sun moves with respect to the sun, Earth and Moon systems. .		Constructing Explanations	" ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. "	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Allow students to create a model of their thinking about causes of day and Night. The flashlight represents the sun. Remember that the side facing the sun will have day light while the side facing away will have night. Allow students to use their models to explain the concept of day and night. Turn lights off to make room as dark as possible.	• Globe • Flashlight • self-stick notes	Developing and Using Models. Constructing Explanations	" ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. "	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Students use their models to construct explanation about the causes of night and day.	• Notebooks	Constructing Explanations	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "

Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Watch the video clip on rotation of earth causing day and night.	• Day and Night Video: https://www.youtube.com/watch?v=pLl8sDZRSYg&noredirect=1	Developing and Using Models. Constructing Explanations	" ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. "	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Use your model to explain what would happen if the earth stopped rotating.	• Lunar Phase Animation: http://www.solarviews.com/cap/moon/vmoon2.htm	Constructing Explanations	" ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. "	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.
Extend: How will students deepen their conceptual understanding through use in new context?	Watch the video clip on rotation of earth causing day and night.	• Day and Night Video: https://www.youtube.com/watch?v=pLl8sDZRSYg&noredirect=1	Constructing Explanations	" ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. "	Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions.
Lesson Title/Number: Earth and Moon	**Learning Objective(s):** Explain the causes of the Moon's phases as it orbits Earth.				**Lesson Duration:**

Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students write what they know about the moon. They draw diagrams of the moon as they have seen it.	• Phases of the Moon Lesson Plan: http://www.brainpop.com/educators/community/lesson-plan/phases-of-the-moon-lesson-plan-position-of-the-planets/	Asking questions	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	
Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Show the students drawings of the phases of the moon made by Galileo Guide them to compare the drawing with theirs.		Constructing explanations	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "
Explore: What hands-on/minds-on common experience(s) will you provide for students?	"Phases of the Moon Lab". Let the students explore phases of the moon by letting them experiment with models of the moon, and a light source. Reinforce concepts of perspective, and cyclical patterns. Scaffold the exercise with a worksheet that includes vocabulary for phase names.	• 2" (5 cm) Styrofoam ball glued to a stick for each student and teacher • Clamp-on light fixture with 150-watt bulb, • Transparency of The Moon's Phases chart • Parent letter	Developing and using models	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "

Explain: How will you help students connect their exploration to the concept/topic under investigation?	Use models of the Sun, earth and moon to explain: The reason for day and night on earth. The time for one earth rotation (24 hours) The time for one moon orbit (29 ½ days) The time for one moon rotation (29 ½ days) The "far side" of the moon. Compare moon and Earth. Discuss gravity on the moon.	• Moon Quest: http://btc.montana.edu/ceres/html/MoonQuest/Quemoon1.html	Constructing Explanations	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "
Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Students keep a moon log for a month and use data collected to predict and explain motion of the moon. Guide students to discuss why visitors to the moon need space suit	• Force, Gravity, Revolution and Rotation Lesson Plan: http://www.brainpop.com/educators/community/lesson-plan/force-gravity-revolution-and-rotation/?bp-topic=earth	Constructing explanations	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Patterns of Moonlight" Give the students a set of images of various phases of the moon. Ask them to predict image images of moon in chronological order. Assess the student understanding and adjust the lesson accordingly.	• Photos of phases of the moon	Asking Questions. Constructing Explanations.	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "
Extend: How will students deepen their conceptual understanding through use in new context?	What would it be like to live on the moon or another planet? If something were to happen to the earth in the future it might become an important question. Get students to design and build their own vision of a future	• Lunar Phase Animation: http://www.solarviews.com/cap/moon/vmoon2.htm	Constructing Explanations.	ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause	"Patterns can be used as evidence to support an explanation. Systems and System Models

	colony while thinking about some of the factors that will influence their designs. See link for detail.			observable patterns.	A system can be described in terms of its components and their interactions. "
Lesson Title/Number: Solar System	**Learning Objective(s):** Describe the solar system and relate solar system objects (e.g. planets, dwarf planets, moons, asteroids, and comets).				**Lesson Duration:**
Learning Cycle ***What lesson elements will support students' progress towards mastery of the learning objectives(s)?*** ****Elements do not have to be in conducted in sequence.***	***Learning Activities*** ***What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?***	***Resources/Materials*** ***What curricular resources/materials are available to facilitate the implementation of the learning activities?***	***Science and Engineering Practices*** ***What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?***	***Disciplinary Core Ideas*** ***What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?***	***Crosscutting Concepts*** ***What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?***
Elicit: How will you access students' prior knowledge?	Students write questions they have about the solar system.	• Hands on Activities: http://www.spacegrant.hawaii.edu/class_acts/	Asking Questions. Constructing Explanations.	• Classify the objects in the solar system into categories based on qualitative and quantitative data. • Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "

Engage: How will you capture students' interest and get students' minds focused on the concept/topic?	Show a model or picture of solar system	• Solar System Lessons: https://solarsystem.nasa.gov/planets/profile.cfm?Object=SolarSys&Display=Educ&Page=All	Asking Questions. Constructing Explanations.	• Classify the objects in the solar system into categories based on qualitative and quantitative data. • Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "
Explore: What hands-on/minds-on common experience(s) will you provide for students?	Students research sizes of objects in the solar system relative to earth. Create a model to represent the objects -planets.	• Computer	Constructing Explanations.	• Classify the objects in the solar system into categories based on qualitative and quantitative data. • Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "
Explain: How will you help students connect their exploration to the concept/topic under investigation?	Use the models to explain how planets move in the solar system, forces that keep them in place. Differentiate between the rocky planets and gas giants.		Developing and using models Constructing Explanations.	• Classify the objects in the solar system into categories based on qualitative and quantitative data. • Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "

Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?	Guide students to discuss how we learn about the solar system. Why NASA explores with probes instead of astronauts	• Mission Solar System: http://pbskids.org/designsquad/parentseducators/guides/mission_resources.html	Asking Questions. Constructing Explanations.	• Classify the objects in the solar system into categories based on qualitative and quantitative data. • Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "
Evaluate: How will students demonstrate their mastery of the learning objective(s)?	Respond with evidence from research-Could earths living things be able to live on the other rocky planets or the gas giants? Why or why not.		Asking Questions. Constructing Explanations.	• Classify the objects in the solar system into categories based on qualitative and quantitative data. • Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "

Extend: How will students deepen their conceptual understanding through use in new context?	"At the end of the last Apollo 15 moon walk, Commander David Scott performed a live demonstration for the television cameras. He held out a geologic hammer and a feather and dropped them at the same time. The Apollo 15 Hammer-Feather Drop is found at: http://nssdc.gsfc.nasa.gov/planetary/lunar/apollo_15_feather_drop.html 3. Based on your understanding of gravity, predict what you think will happen and explain why you cannot recreate this demonstration in your classroom. "		Asking Questions. Constructing Explanations.	• Classify the objects in the solar system into categories based on qualitative and quantitative data. • Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.	"Patterns can be used as evidence to support an explanation. Systems and System Models A system can be described in terms of its components and their interactions. "