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<p><b>Engage: How will you capture students' interest and get students' minds focused on the concept/topic?</b></p>	<p>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.</p>		<p>Constructing Explanations</p>	<p>" 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. "</p>	<p>Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p>
<p><b>Explore: What hands-on/minds-on common experience(s) will you provide for students?</b></p>	<p>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.</p>	<ul style="list-style-type: none"> <li>• Globe</li> <li>• Flashlight</li> <li>• self-stick notes</li> </ul>	<p>Developing and Using Models. Constructing Explanations</p>	<p>" 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. "</p>	<p>Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p>
<p><b>Explain: How will you help students connect their exploration to the concept/topic under investigation?</b></p>	<p>Students use their models to construct explanation about the causes of night and day.</p>	<ul style="list-style-type: none"> <li>• Notebooks</li> </ul>	<p>Constructing Explanations</p>	<p>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.</p>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions. "</p>

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<p><b>Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?</b></p>	<p>Watch the video clip on rotation of earth causing day and night.</p>	<ul style="list-style-type: none"> <li>Day and Night Video: <a href="https://www.youtube.com/watch?v=pLI8sDZRSYg&amp;norredirect=1">https://www.youtube.com/watch?v=pLI8sDZRSYg&amp;norredirect=1</a></li> </ul>	<p>Developing and Using Models. Constructing Explanations</p>	<p>"</p> <p>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.</p> <p>"</p>	<p>Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p>
<p><b>Evaluate: How will students demonstrate their mastery of the learning objective(s)?</b></p>	<p>Use your model to explain what would happen if the earth stopped rotating.</p>	<ul style="list-style-type: none"> <li>Lunar Phase Animation: <a href="http://www.solarviews.com/cap/moon/vmoon2.htm">http://www.solarviews.com/cap/moon/vmoon2.htm</a></li> </ul>	<p>Constructing Explanations</p>	<p>"</p> <p>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.</p> <p>"</p>	<p>Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p>
<p><b>Extend: How will students deepen their conceptual understanding through use in new context?</b></p>	<p>Watch the video clip on rotation of earth causing day and night.</p>	<ul style="list-style-type: none"> <li>Day and Night Video: <a href="https://www.youtube.com/watch?v=pLI8sDZRSYg&amp;norredirect=1">https://www.youtube.com/watch?v=pLI8sDZRSYg&amp;norredirect=1</a></li> </ul>	<p>Constructing Explanations</p>	<p>"</p> <p>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.</p> <p>"</p>	<p>Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p>
<p><b>Lesson Title/Number:</b> Earth and Moon</p>		<p><b>Learning Objective(s):</b> Explain the causes of the Moon's phases as it orbits Earth.</p>			<p><b>Lesson Duration:</b></p>



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<p><b>Learning Cycle</b></p> <p><i>What lesson elements will support students' progress towards mastery of the learning objective(s)?</i></p> <p><i>*Elements do not have to be in conducted in sequence.</i></p>	<p><b>Learning Activities</b></p> <p><i>What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?</i></p>	<p><b>Resources/Materials</b></p> <p><i>What curricular resources/materials are available to facilitate the implementation of the learning activities?</i></p>	<p><b>Science and Engineering Practices</b></p> <p><i>What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?</i></p>	<p><b>Disciplinary Core Ideas</b></p> <p><i>What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?</i></p>	<p><b>Crosscutting Concepts</b></p> <p><i>What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?</i></p>
<p><b>Elicit: How will you access students' prior knowledge?</b></p>	<p>Students write what they know about the moon. They draw diagrams of the moon as they have seen it.</p>	<ul style="list-style-type: none"> <li>Phases of the Moon Lesson Plan: <a href="http://www.brainpop.com/educators/community/lesson-plan/phases-of-the-moon-lesson-plan-position-of-the-planets/">http://www.brainpop.com/educators/community/lesson-plan/phases-of-the-moon-lesson-plan-position-of-the-planets/</a></li> </ul>	<p>Asking questions</p>	<p>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.</p>	
<p><b>Engage: How will you capture students' interest and get students' minds focused on the concept/topic?</b></p>	<p>Show the students drawings of the phases of the moon made by Galileo Guide them to compare the drawing with theirs.</p>		<p>Constructing explanations</p>	<p>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.</p>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p> <p>"</p>
<p><b>Explore: What hands-on/minds-on common experience(s) will you provide for students?</b></p>	<p>"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.</p>	<ul style="list-style-type: none"> <li>2" (5 cm) Styrofoam ball glued to a stick for each student and teacher</li> <li>Clamp-on light fixture with 150-watt bulb,</li> <li>Transparency of The Moon's Phases chart</li> <li>Parent letter</li> </ul>	<p>Developing and using models</p>	<p>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.</p>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p> <p>"</p>

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<p><b>Explain: How will you help students connect their exploration to the concept/topic under investigation?</b></p>	<p>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.</p>	<ul style="list-style-type: none"> <li>• Moon Quest: <a href="http://btc.montana.edu/ceres/html/MoonQuest/Quemooon1.html">http://btc.montana.edu/ceres/html/MoonQuest/Quemooon1.html</a></li> </ul>	<p>Constructing Explanations</p>	<p>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.</p>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p> <p>"</p>
<p><b>Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?</b></p>	<p>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</p>	<ul style="list-style-type: none"> <li>• Force, Gravity, Revolution and Rotation Lesson Plan: <a href="http://www.brainpop.com/educators/community/lesson-plan/force-gravity-revolution-and-rotation/?bp-topic=earth">http://www.brainpop.com/educators/community/lesson-plan/force-gravity-revolution-and-rotation/?bp-topic=earth</a></li> </ul>	<p>Constructing explanations</p>	<p>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.</p>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p> <p>"</p>
<p><b>Evaluate: How will students demonstrate their mastery of the learning objective(s)?</b></p>	<p>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.</p>	<ul style="list-style-type: none"> <li>• Photos of phases of the moon</li> </ul>	<p>Asking Questions. Constructing Explanations.</p>	<p>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.</p>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p> <p>"</p>
<p><b>Extend: How will students deepen their conceptual understanding through use in new context?</b></p>	<p>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</p>	<ul style="list-style-type: none"> <li>• Lunar Phase Animation: <a href="http://www.solarviews.com/cap/moon/vmoon2.htm">http://www.solarviews.com/cap/moon/vmoon2.htm</a></li> </ul>	<p>Constructing Explanations.</p>	<p>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</p>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p>

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	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. "
<b>Lesson Title/Number:</b> Solar System		<b>Learning Objective(s):</b> Describe the solar system and relate solar system objects (e.g. planets, dwarf planets, moons, asteroids, and comets).			<b>Lesson Duration:</b>
<b>Learning Cycle</b>  <i>What lesson elements will support students' progress towards mastery of the learning objective(s)?</i>  <i>*Elements do not have to be in conducted in sequence.</i>	<b>Learning Activities</b>  <i>What specific learning experiences will support ALL students' progress towards mastery of the learning objective(s)?</i>	<b>Resources/Materials</b>  <i>What curricular resources/materials are available to facilitate the implementation of the learning activities?</i>	<b>Science and Engineering Practices</b>  <i>What specific practices do students need to use in order to progress towards mastery of the learning objective(s)?</i>	<b>Disciplinary Core Ideas</b>  <i>What core ideas do students need to understand in order to progress towards mastery of the learning objective(s)?</i>	<b>Crosscutting Concepts</b>  <i>What crosscutting concepts will enrich students' application of practices and their understanding of core ideas?</i>
<b>Elicit: How will you access students' prior knowledge?</b>	Students write questions they have about the solar system.	<ul style="list-style-type: none"> <li>Hands on Activities: <a href="http://www.spacegrant.hawaii.edu/class_acts/">http://www.spacegrant.hawaii.edu/class_acts/</a></li> </ul>	Asking Questions. Constructing Explanations.	<ul style="list-style-type: none"> <li>Classify the objects in the solar system into categories based on qualitative and quantitative data.</li> <li>Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.</li> </ul>	"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. "

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<p><b>Engage: How will you capture students' interest and get students' minds focused on the concept/topic?</b></p>	<p>Show a model or picture of solar system</p>	<ul style="list-style-type: none"> <li>Solar System Lessons: <a href="https://solarsystem.nasa.gov/planets/profile.cfm?Object=SolarSys&amp;Display=Educ&amp;Page=All">https://solarsystem.nasa.gov/planets/profile.cfm?Object=SolarSys&amp;Display=Educ&amp;Page=All</a></li> </ul>	<p>Asking Questions. Constructing Explanations.</p>	<ul style="list-style-type: none"> <li>Classify the objects in the solar system into categories based on qualitative and quantitative data.</li> <li>Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.</li> </ul>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p> <p>"</p>
<p><b>Explore: What hands-on/minds-on common experience(s) will you provide for students?</b></p>	<p>Students research sizes of objects in the solar system relative to earth. Create a model to represent the objects -planets.</p>	<ul style="list-style-type: none"> <li>Computer</li> </ul>	<p>Constructing Explanations.</p>	<ul style="list-style-type: none"> <li>Classify the objects in the solar system into categories based on qualitative and quantitative data.</li> <li>Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.</li> </ul>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p> <p>"</p>
<p><b>Explain: How will you help students connect their exploration to the concept/topic under investigation?</b></p>	<p>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.</p>		<p>Developing and using models Constructing Explanations.</p>	<ul style="list-style-type: none"> <li>Classify the objects in the solar system into categories based on qualitative and quantitative data.</li> <li>Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.</li> </ul>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p> <p>"</p>

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<p><b><i>Elaborate: How will students apply their learning and develop a more sophisticated understanding of the concept/topic?</i></b></p>	<p>Guide students to discuss how we learn about the solar system. Why NASA explores with probes instead of astronauts</p>	<ul style="list-style-type: none"> <li>Mission Solar System: <a href="http://pbskids.org/designsguad/parentseducators/guides/mission_resources.html">http://pbskids.org/designsguad/parentseducators/guides/mission_resources.html</a></li> </ul>	<p>Asking Questions. Constructing Explanations.</p>	<ul style="list-style-type: none"> <li>Classify the objects in the solar system into categories based on qualitative and quantitative data.</li> <li>Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.</li> </ul>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p> <p>"</p>
<p><b><i>Evaluate: How will students demonstrate their mastery of the learning objective(s)?</i></b></p>	<p>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.</p>		<p>Asking Questions. Constructing Explanations.</p>	<ul style="list-style-type: none"> <li>Classify the objects in the solar system into categories based on qualitative and quantitative data.</li> <li>Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.</li> </ul>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions.</p> <p>"</p>

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<p><b>Extend: How will students deepen their conceptual understanding through use in new context?</b></p>	<p>"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: <a href="http://nssdc.gsfc.nasa.gov/planetary/lunar/apollo_15_feather_drop.html">http://nssdc.gsfc.nasa.gov/planetary/lunar/apollo_15_feather_drop.html</a></p> <p>3. Based on your understanding of gravity, predict what you think will happen and explain why you cannot recreate this demonstration in your classroom. "</p>		<p>Asking Questions. Constructing Explanations.</p>	<ul style="list-style-type: none"><li>• Classify the objects in the solar system into categories based on qualitative and quantitative data.</li><li>• Compare and contrast the planets in the solar system in relationship to the distance each of the planets are from the Sun.</li></ul>	<p>"Patterns can be used as evidence to support an explanation.</p> <p>Systems and System Models</p> <p>A system can be described in terms of its components and their interactions. "</p>
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