

Grade 5 Unit 3

Earth Systems: Interactions Within the Earth, Sun, and Moon System Late January - End of March/MP 3

Unit Summary:

This Earth and Space science unit helps students develop the idea that observable phenomena such as time, season, sunrise/sunset, moon phase, gravity, and shooting stars are the results of natural laws governing the movement of bodies through space. Students will also develop an understanding that it is Earth's place in the universe that allows life to exist and flourish on Earth.

- Understandings to include:
 - Sun's daily patterns due to Earth's rotation
 - Sun and Earth's orbit and annual patterns
 - Stars and constellations
 - Moon's orbit and lunar cycle
 - Planets and the solar system
 - Gravity
 - Star brightness (relative brightness)
 - Requirements of a habitable planet

Concepts	Vocabulary
<ul style="list-style-type: none"> ● A system can be described in terms of its components and their interactions ● Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). ● The Earth's major systems interact in multiple ways to affect Earth's surface materials and processes. ● Natural bodies of water support a variety of ecosystems and organisms, shapes landforms, and influences climate. ● Winds and clouds in the atmosphere interact with landforms to determine patterns of weather. 	<p>Rotation, orbit, ellipse, hydrosphere, geosphere, atmosphere, interaction, systems, relative distance, brightness, axis, patterns, gravity, asteroid, comet, meteor, meteorite</p>

Stage 1 – Desired Results (Also see Disciplinary Core Ideas below)

Performance Expectations: (PE) (Established Goals / Content Standards)

- **5-PS2-1: Support an argument that the gravitational force exerted by Earth on objects is directed down.**
 - **Clarification Statement:** “Down” is a local description of the direction that points toward the center of the spherical Earth.
 - **Assessment Boundary:** Assessment does not include mathematical representation of gravitational force.
- **5-ESS1-1: Support an argument that the apparent brightness of the sun and stars is due to their**

relative distances from the Earth.

- **Assessment Boundary:** Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).
- **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.**
 - **Clarification Statement:** Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.
 - **Assessment Boundary:** Assessment does not include causes of seasons.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models</p> <ul style="list-style-type: none"> ● Develop a model using an example to describe a scientific principle. <p>Engaging in Argument from Evidence</p> <ul style="list-style-type: none"> ● Support an argument with evidence, data, or a model. (5-PS2-1), (5-ESS1-1) <p>Analyzing and Interpreting Data</p> <ul style="list-style-type: none"> ● Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. 	<p>PS2.B: Types of Interactions</p> <ul style="list-style-type: none"> ● The gravitational force of Earth acting on an object near Earth’s surface pulls that object toward the planet’s center. (5-PS2-1) <p>ESS1.A: The Universe and its Stars</p> <ul style="list-style-type: none"> ● 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. (5-ESS1-1) <p>ESS1.B: Earth and the Solar System</p> <ul style="list-style-type: none"> ● 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. 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. (5-ESS1-2) 	<p>Cause and Effect</p> <ul style="list-style-type: none"> ● Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1) <p>Scale, Proportion, and Quantity</p> <ul style="list-style-type: none"> ● Natural objects exist from the very small to the immensely large. (5-ESS1-1) <p>Patterns</p> <ul style="list-style-type: none"> ● Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2) <p>Systems and Systems Models</p> <ul style="list-style-type: none"> ● A system is an organized group of related objects or components. Models can be used for understanding and predicting the behavior of systems. (Links to unit as a whole)

<p>Enduring Understandings</p> <p>Students will understand:</p> <ul style="list-style-type: none"> • Predictable patterns occur in the universe • Planets and a variety of other bodies form a system of objects orbiting the sun. 	<p>Essential Questions</p> <ul style="list-style-type: none"> • How do patterns control the universe? • What is the universe, and what is Earth's place in it?
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Stage 2 – Model Assessments

<p>Summative Performance Task(s):</p> <ul style="list-style-type: none"> • Create a project guided and assessed by teacher-created rubric (either computer or paper based) to include gravity (define and give example), planets (including distance from the sun - not cut and pasted), moon phases (give 3 examples and explain their shape and appearance). • Mystery Science Unit Assessment <p>• Audience:</p> <ul style="list-style-type: none"> • Peers and teachers 	<p>Formative Evidence:</p> <ul style="list-style-type: none"> • Mystery Science 3 - 4 question comprehension check for each mystery. • Solar system model using beads: https://www.jpl.nasa.gov/edu/teach/activity/solar-system-bead-activity/ • Dk find out quiz: https://www.dkfindout.com/us/quiz/space/take-solar-system-quiz/ • Student-created assessment (contributions from groups of students or each student) • Brainpop solar system and individual related topics: https://www.brainpop.com/science/space/solarsystem/
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Stage 3 – Learning Plan Resources and Activities

<p>Suggested Resources for Planning:</p> <ul style="list-style-type: none"> • Mystery Science • NewsELA • Super Science • Brainpop • Scholastic • NJCTL.org • thewonderofscience.com • other free online resources • PBS Meet the Planets activity: https://nj.pbslearningmedia.org/resource/nvfl.sci.space.lpplanets/meet-the-planets/ • Education.com: https://www.lpi.usra.edu/education/resources/s_system/s_system.shtml • Study Jams Solar System: http://studyjams.scholastic.com/studyjams/jams/science/index.htm?topic_id=ss • Nasa Solar System activities: https://www.jpl.nasa.gov/edu/teach/tag/topic/Solar+System • Inspiration Laboratories activities: https://inspirationlaboratories.com/planet-activities/ • https://www.getepic.com/ (free)

Learning Activities:

- Engineering tasks https://www.teachengineering.org/curricularunits/view/cub_solar_curricularunit
- Earth and its characteristics: https://www.teachengineering.org/lessons/view/cub_solar_lesson04
- Brainpop <https://www.brainpop.com/science/space/solarsystem/>
- Webquest: <http://users.zoominternet.net/~eanderson/webquest/task.html>
- **Mystery Science mysteries: Spaceship Earth (Sun, Moon, Stars & Planets)**
 - **Mystery: Day, Night and Earth's Rotations** [How fast does the Earth spin?](#)
 - **Mystery: Earth's Rotation and Time** [Who set the first clock?](#)
 - **Mystery: Seasonal Changes and Sun's Path** [How can the sun tell you the season?](#)
 - **Mystery: Seasons and Earth's Revolution** [Why do the stars change with the seasons?](#)
 - **Mystery: Moon Phases, Lunar Cycle** [Why does the moon change shape?](#)
 - **Mystery: Planets and Solar Systems** [What are the wandering stars?](#)
 - **Mystery: Gravity** [Why is gravity different on other planets?](#)
 - **Mystery: Star Brightness and Habitable Planets** [Could there be life on other planets?](#)
- Possible provocative questions:
 - Why does the sun rise and set?
 - Why does the moon change shape?
 - Why do we have seasons?
 - What makes a planet livable?

Suggested Methods: (The following methods anchor learning with a purpose, mitigating the “why do I need to know this” questions.)

- Phenomena based learning
- Problem Based Learning (PBL)
- Inquiry Based Learning
- Case studies
- Engaging in Argument w/ evidence