

5th Grade Earth Science Unit

Grade level: 5

Unit: Earth

Time Frame: Sept.-Nov.

Unit Essential Questions:

- How can we understand the movement of celestial bodies and how they affect us?
- How can observations from Earth (related to the moon and the sun) be explained using physical models?
- What are the characteristics of planets and what is their motion?

Big ideas:

- Earth's motion around the sun (rotation, revolution) as it relates to seasons, length of day and year. Use models to understand motion of Earth as it relates to Sun and apparent motion
- Identify sun-earth-moon aspects such as moon phases, eclipses, and tides. Use models and data analysis.
- Explore the solar system: what it contains, how it moves, and what informs the movement. Use physical models to planet size, distance, and movement, as well as, gravity and inertia as shapers of these motions.

Essential Concepts/Skills/

GLCE's:

E.ES.M.6 Seasons – Seasons result from annual variations in the intensity of sunlight and length of day due to the tilt of the axis of the Earth relative to the plane of its yearly orbit around the sun.

E.ES.05.61 Demonstrate and explain seasons using a model.

E.ES.05.62 Explain how the revolution of the Earth around the sun defines a year.

E.ST.M.1 Solar system – The sun is the central and largest body in our solar system.

Earth is the third planet from the sun in a system that includes other planets and their moons, as well as smaller objects, such as asteroids and comets.

E.ST.05.11 Design a model of the solar system that shows the relative order and scale of the planets, dwarf planets, comets and asteroids to the sun.

E.ST.M.2 Solar System Motion – Gravity is the force that keeps most objects in the solar system in regular and predictable motion.

E.ST.05.21 Describe the motion of planets and moons in terms of rotation on axis and orbits due to gravity.

E.ST.05.22 Explain the phases of the moon.

E.ST.05.23 Explain the apparent motion of the stars (constellations) and the sun across the sky

E.ST.05.24 Explain lunar and solar eclipses.

E.ST.05.25 Explain the tides of the oceans as they relate to the gravitational pull and orbit of the moon.

S.IP.05.13 Investigations

Use tools and equipment (spring scales, stop watches, meter sticks and tapes, models, hand lens) appropriate to scientific investigations.

NGSS:

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 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.]

PS2.B: Types of Interactions

>The gravitational force of Earth acting on an object near Earth’s surface pulls that object toward the planet’s center. (5-PS2-1)

ESS1.A: The Universe and its Stars

>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)

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. 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)

PRE-PLANNING CONSIDERATIONS

Misconceptions that need to be addressed:

- *Seasons are caused by Earth’s distance from the Sun.*
- *Earth is stationary and the sun, moon, and stars, rotate around it.*
- *Stars/constellations are inside our solar system.*
- *The moon is only visible at night.*
- *Moon phases are caused by Earth’s shadow.*
- *Planets and the moon emit their own light.*
- **Good tool for many misconceptions with explanations. NESD San Antonio TX**

http://www.neisd.net/curriculum/SchImprov/sci/program/misconceptions_inter.htm#gravity

Vocabulary

Critically Important Vocabulary

Instructionally Useful

seasons tilt axis revolution rotation solar system planet dwarf planet asteroids comets gravity gravitational pull phases stars	constellations lunar solar eclipse tides	latitude model circular elliptical apparent motion satellite celestial North Star Mercury, Venus Earth, Mars Jupiter, Saturn Uranus Neptune Pluto
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Supplies to gather or things that need to be done:

- **Bound notebook for each student**
- **balls of various sizes and bottle caps for stabilizers**
- **sticks/yardstick to create shadow**
- **compasses**
- **chalk/sidewalk chalk**
- **masking tape**
- **rulers**
- **clear plastic domes**
- **washers**
- **string**
- **large glass jars**
- **turntable/Lazy Susan**
- **dowels/pencils**
- **flashlights (D-cell batteries)**
- **whiteboards/poster paper**
- **Stellarium software on iPads/laptops**
- **moon phase cards ([link](#))**
- **small round balloons (white preferably)**
- **bright lamp/light source**
- **rope-cut in various lengths to represent planet orbits (8)**
- **graph paper**
- **clay**
- **scaled set of planets photos and planet photos**

Additional Resources

Calculate weight and age on other planets and has many other links about space at the bottom of the page

www.exploratorium.edu/ronh/weight

Different activities by grade level on **gravity**

<https://solarsystem.nasa.gov/yss/display.cfm?Year=2011&Month=9&TAB=Classrooms>

Make and take tidewheel...shows spring tide/neap tide and moon phases

www.srh.weather.gov/srh/jetstream/ocean/images/tidewheel_w.pdf

Shows **pictures of high and low tides** taken of the same body of water....can be used to have students pick out the differences.

<http://www.lpi.usra.edu/education/explore/marvelMoon/activities/whatIf/dance/HighLowTideImages.pdf>

Youtube video **explaining high/low tides** include the relationships between the Earth, moon, and sun also shows Spring Tides and the difference between them and regular high/low tides

<https://www.youtube.com/watch?v=CTQ6ciHENgI>

Shows different **constellations** for different times of the year and are interactive, includes games for students to explore

<http://interactivesites.weebly.com/constellations.html>

Videos that Explain science topics "Make Me a Genius"

<https://www.youtube.com/channel/UCEA-kbwNIY3YTmp4nVjkUjQ>

Interactive Solar System diagram with orbits and comets

http://www.kidsastronomy.com/solar_system.htm

Mr. Nussbaum Create a **solar system game**

<http://mrnussbaum.com/solar-system-maker/>

Mr. Nussbaum **Space** fun site for all subjects with a large space area

<http://mrnussbaum.com/space-2/>

Short quiz based site **Solar System**

http://schools.bcsd.com/fremont/5th_sci_weather_space.htm

Quizlet-Vocabulary study/quiz site sight cards, matching, etc -space

<http://quizlet.com/8960657/5th-grade-sciencespace-flash-cards/>

***Stellarium for laptops** use the windows choice at top of page

<http://www.stellarium.org/>

***Stellarium for iPads**, iPhones, smart phones etc. information

<http://www.ifreeware.net/download-stellarium.html>

Quizlet ELMOS Space Study

<http://quizlet.com/4811543/elmos-space-study-guide-flash-cards/>

Notes:

5th Grade Earth Science Engineering Task

'Lunch in Outer Space' link

http://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_human/cub_human_lesson04_activity1.xml

Summary

Students learn about the unique challenges astronauts face while eating in outer space. They explore different food choices and food packaging. Students learn about the engineering design process, and then, as NASA engineering teams, they design and build original model devices to help astronauts eat in a microgravity environment --- their own creative devices for food storage and meal preparation.

Engineering Connection

●○○ Relating science and/or math concept(s) to engineering ⓘ

Engineers are involved in all aspects of space travel and living. Many astronauts are engineers! Because of the microgravity environment, eating in space is a great challenge, so NASA engineers develop creative devices to help astronauts eat while traveling in away from the Earth's gravity.