



Grade 5 - Unit 2 - Earth's Place in the Universe

Unit Focus

In this unit, students will inquire about celestial patterns observed in our world and outer space. By developing models, students will be able to analyze patterns and data related to Earth's rotation and revolution, axial tilt, and distance to other celestial bodies to form conclusions. Students will demonstrate an understanding of the law of universal gravitation and predict patterns of moon phases by analyzing images and data. The unit will provide ample opportunities for students to synthesize knowledge from data collected during their solar cooker trials as they gain a better understanding of Earth's motion and how it affects the results of their design and testing conditions.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Next Generation Science Standards (DCI) Science: 5 <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. (ESS1.5.A1)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. (ESS1.5.B1)Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (ETS1.5.C1)The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (PS2.5.B1) Next Generation Science Standards (content standards) Elementary Standards: 5 <ul style="list-style-type: none">Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth. (5-ESS1-1)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. (5-ESS1-2)	<i>Students will be able to independently use their learning to...</i> T1 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions. T2 Create models to explore complex systems, show mastery of key science concepts, and/or develop solutions through creation of a product open to testing and redesign.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Stars range greatly in their position and distance from the earth U2 All objects, including galaxies in the universe, are shaped by the force of gravity. U3 The solar system is held in orbit around the sun by its gravitational pull on them. U4 Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. U5 The model of our solar system can explain phenomena such as eclipses and the Earth's seasons. U6 Varying intensities of sunlight across the surface of the earth causes the seasons U7 Good experimental design leads to precise and accurate data. U8 Scientists examine evidence to formulate interesting questions and solve problems.	<i>Students will keep considering...</i> Q1 How does gravity affect celestial bodies and the patterns I see in the sky? Q2 What patterns do I see in the sky? Q3 Based on what I am seeing, how does it shape my thinking? Q4 What do the results tell me? What patterns do I see or what conclusions can I draw?

Stage 1: Desired Results - Key Understandings

- Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. (3-5-ETS1-3)

Madison Public Schools Profile of a Graduate

- Design: Engaging in a process to refine a product for an intended audience and purpose. (POG.2.2)
- Collective Intelligence: Working respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. (POG.3.1)

Acquisition of Knowledge and Skill

Knowledge

Students will know...

K1 The sun, Earth and its moon are spherical objects that move in two ways: they spin (rotate) and they change positions relative to each other (revolve).
K2 The sun is a star that radiates away from the sun in all directions.
K3 Light from the sun illuminates objects that reflect light, including Earth and its moon. The side of the Earth that is facing the sun experiences daylight; the side of the Earth facing away from the sun experiences night. All parts of the Earth experience a cycle that includes both day and night, providing evidence that the Earth is rotating on its axis.
K4 The sun appears to rise at the eastern horizon and set at the western horizon due to the earth's rotation.
K5 The amount of time it takes for the Earth to rotate once on its axis is regular and predictable (24 hours), and is called "a day." Earth's rotation makes it appear as if the sun is moving across the sky from east to west.
K6 Earth's axial tilt and revolution around the sun affects the amount of direct or indirect light on the hemispheres.
K7 The changes in the moon's phases occur in a regular and predictable sequence. At predictable periods during the lunar cycle, the moon is visible in either the daytime or the nighttime sky.
K8 Mass and distance of objects affect the force of gravity.
K9 Vocabulary: sphere, illuminate, reflect, rotate, day/night cycle (24-hour rotation period), horizon, orbit, revolve, month (one lunar cycle), moon phases, gravity, law of universal gravitation

Skill(s)

Students will be skilled at...

S1 Analyzing time zone tables to see the effect of Earth's rotation.
S2 Analyzing daylight hour data to understand the effect of Earth's axial tilt.
S3 Identifying similarities and differences of moon phase patterns.
S4 Comparing and contrasting distances and masses of celestial bodies to the sun.
S5 Comparing and calculating your weight on other planets based on the amount of gravity of the planet.
S6 Synthesizing data to improve a design.