Grade 5 Science - Unit 2 - Earth & Space

Unit Focus

This Grade 5 Science unit engages students in understanding how Earth's movements influence day/night cycles, seasonal patterns, and gravitational forces. Throughout the unit, students will investigate Earth's rotation and its effects on day and night using models, text-based evidence, and interactive activities like globe and flashlight demonstrations. They will also explore time zones and analyze how Earth's rotation causes different locations to experience different times of day. As they transition to learning about seasonal patterns, students will discover how Earth's axial tilt and orbit lead to varying sunlight angles and changes in the length of daylight throughout the year. They will model the cause of seasons and examine extreme variations in daylight at the poles. Finally, students will explore gravity, investigating its role on Earth and other celestial bodies, and how it affects movement, weight, and planetary orbits within the Solar System. Through hands-on experiments, data analysis, and a targeted Mystery Science activity, students will gain a better understanding of how Earth's physical properties affect things around them locally and globally.

Stage 1: Desired Results - Key Understandings

Standard(s)

Next Generation Science Standards

Cross Cutting Concepts: 5

- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2) (5.ES.CC.1.1)
- Cause and effect relationships are routinely identified and used to explain change. (5- PS2-1) (5.ES.CC.2.1)
- Natural objects exist from the very small to the immensely large. (5- ESS1-1) (5.ES.CC.3.1)

Disciplinary Core Ideas: 5

- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1) (5.PS2.B.1)
- 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) (5.ESS1.A.1)
- 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) (5.ESS1.B.1)

Performance Expectations: 5

- Support an argument that the gravitational force exerted by Earth on objects is directed down. (5-PS2-1)

Transfer

Students will be able to independently use their learning to...

T1 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)

Students will understand that...

U1 The sun appears brighter than other stars because it is much closer to Earth, even though other stars may be larger or more luminous.

U2 Shadows change in length and direction throughout the day due to Earth's rotation, and star patterns change with the seasons due to Earth's orbit around the sun.

U3 Gravity is a force that pulls objects toward the center of the Earth, and it acts the same way no matter where an object is on Earth.

U4 Scientists use graphical displays and data analysis to reveal patterns in astronomical and gravitational phenomena.

Essential Question(s)

Students will keep considering...

Q1 Why does the sun appear brighter than other stars in the sky?

Q2 How do patterns in shadows, day and night, and seasonal star visibility help us understand Earth's motion?

Q3 How does gravity affect objects on Earth?

Q4 How do scientists use data and observations to study space and celestial patterns?

Acquisition of Knowledge and Skill

Knowledge

Students will know...

K1 The concept of "apparent brightness" and how distance affects how bright a star appears.

Skill(s)

Students will be skilled at...

S1 Gather and analyze evidence to support an argument about why the sun appears brighter than other stars.

Stage 1: Desired Results - Key Understandings		
• 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) Science and Engineering Practices: 5 • Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2) (5.SS.SEP.1.2) • Support an argument with evidence, data, or a model. (5- PS2-1),(5-ESS1-1) (5.SS.SEP. 2.1) **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)	**K2** Earth's rotation causes patterns of day and night, and its orbit around the sun influences seasonal star visibility. **K3** Shadows change throughout the day based on the position of the sun in the sky. **K4** Gravity pulls objects downward toward the center of the Earth, regardless of their size or location. Mass and distance of objects affect the force of gravity. **K5** 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. **K6** Vocabulary: Planet, Sun's Size, Solar System, Satellite, Constellation, Galaxy, Astronomical, Astronomy, Universe, Earth's Rotation, Galaxy, Axis, Milky Way, Moon Phases, Lunar, Astronomical, Orbit, Annual, Rotation, Revolution, Sun, Gravity, Space, Magnet, Earth's Rotation, Exert, Transfer, Mass, Matter, Orbital, Volume.	**S2** Use data to create graphical representations (e.g., bar graphs, star maps) showing patterns in shadows, day and night, and seasonal star appearances. **S3** Observe and record daily changes in shadows and describe how they relate to the sun's position. **S4** Develop models or demonstrations to explain the effect of Earth's gravity on objects. **S5** Construct arguments using observations and evidence to support claims about gravity and celestial phenomena. **S6** Apply understanding of gravitational force and celestial patterns to real-world contexts, such as navigation, timekeeping, and space exploration. **S7** Identifying similarities and differences of moon phase patterns.