

4th Grade

Unit 3 & 5: Astronomy & Forces/Motion



Essential Questions	Enduring Understandings
<p>Science</p> <ul style="list-style-type: none">• What is a star?• How are stars alike and different from each other?• How does the sun compare to other stars in the night sky?• How are constellations alike and different?• Why are some constellations observed during some seasons, but not during other seasons?• How are planets and stars alike and different in relation to appearance, position, and number in the night sky?• Why are planets seen in different locations in the night sky throughout the year?• How can technology be used to observe distant objects in the sky?• Why are different phases of the moon observed throughout the month? What is the sequence of those phases?• What are the relative sizes of the planets in our solar system?• What is the relative order of the planets from the sun in our solar system?• How can forces be used to make objects move, change direction, or stop?• How is the motion of an object related to the size of the object and the amount of force that is applied to the object?• What is gravity and how does it affect things on the earth?• How do simple machines make work easier for people?	<p>Science</p> <ul style="list-style-type: none">• The patterns of stars in the sky stay the same, although they appear to move across the sky nightly, and different stars can be seen in different seasons.• Telescopes magnify the appearance of some distant objects in the sky, including the moon and the planets.• The number of stars that can be seen through telescopes is dramatically greater than can be seen by the unaided eye.• Planets change their positions against the background of stars.• The earth is one of several planets that orbit the sun, and the moon orbits the earth.• Stars are like the sun, some being smaller and some larger, but so far away that they look like points of light.• The position and motion of an object can be described accurately.• An object's position can be described only by locating it relative to another question.• A force is simply a push or pull (usually on an object).• Forces can cause objects to start moving, stop moving, or change direction.• An object's size and the amount of force exerted on an object affect its speed and motion.• Gravity is the earth's pull on things.• Things on or near the earth are pulled toward it by the earth's gravity.• Simple machines are tools that help us do work.• Simple machines make work easier for us changing the amount of force (pushing or pulling) needed to do certain kinds of work.

Social Studies

- How would you describe the environment (land, climate, resources, and culture) of the different Native Americans nations?
- How did Native Americans use their environment to survive?
- How did the development of the steamboat, the locomotive, and the telegraph impact the American economy?
- How did improvements in transportation and communication affect the Native Americans?
- How did the introduction of the steamboat impact American commerce?
- How do price incentives affect people's behavior and choices?

Math

- Investigate what it means to measure length, weight, liquid volume, time, and angles and understand how to use standardized tools to measure length, weight, liquid volume, time, and angles.
- Understand how different units within a system (customary and metric) are related to each other while understanding that relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz; L, ml; hr, min, sec.
- Solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals.

Real World Connection/PBL:

Mars is one of the most explored worlds in the Solar System, from orbiting satellites to landing probes to moving robot rovers; since the beginning of the use of the telescope in the early 1600's. The big science question for the Mars Exploration Rovers is how past water activity on Mars has influenced the red planet's environment over time. While there is no liquid water on the surface of Mars today, the record of past water activity on Mars can be found in the rocks, minerals, and geologic landforms, particularly in those that can only form in the presence of water. That's why the rovers are specially equipped with tools to study a diverse collection of rocks and soils that may hold clues to past water activity on Mars.

Students will:

- Students will investigate different types of motion
- Students will observe and communicate effects of gravity on objects

- Students will investigate the planets and the constellations

Enduring Understandings

- Things move in many different ways, such as straight, zigzag, round and round, back and forth, fast and slow
- The way to change how something is moving is to give it a push or a pull
- Simple machines make work easier for us changing the amount of force (pushing or pulling) needed to do certain kinds of work.

Essential Questions

- How do objects move?
- How can you make an object move?
- What kinds of objects roll?

STEM Careers

Aerospace Engineer- Perform engineering duties in designing, constructing, and testing aircraft, missiles, and spacecraft. May conduct basic and applied research to evaluate adaptability of materials and equipment to aircraft design and manufacture. May recommend improvements in testing equipment and techniques.

Electrical Engineer- Research, design, develop, test, or supervise the manufacturing and installation of electrical equipment, components, or systems for commercial, industrial, military, or scientific use.

Robotics Engineer- Research, design, develop, or test robotic applications.

Solar Energy Systems Engineer- Perform site-specific engineering analysis or evaluation of energy efficiency and solar projects involving residential, commercial, or industrial customers. Design solar domestic hot water and space heating systems for new and existing structures, applying knowledge of structural energy requirements, local climates, solar technology, and thermodynamics.

Astronomers- Observe, research, and interpret astronomical phenomena to increase basic knowledge or apply such information to practical problems.

Vocabulary

PBL Vocabulary:

Science:

Push, pull, sun, moon, stars, gravity, motion, straight, zigzag, round and round, back and forth, fast and slow, motionless

Math:

Combine, count, digits, efficient, equal, estimate, greater, less, more

Science Standards

S4P3. Students will demonstrate the relationship between the application of a force and the resulting change in position and motion on an object.

S4P3a. Identify simple machines.

S4P3b. Using different size objects, observe how force affects speed and motion.

S4P3c. Explain what happens to the speed or direction of an object when a greater force than the initial one is applied.

Technology (websites and 21st Century Tools)

<http://robotics.nasa.gov/edu>

<http://mars.nasa.gov/mer/home/>

<http://www.space.com/17963-mars-curiosity.html>

Engineering (Implementation of STEM)

Space Rover

Mathematics

SMP s:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others. Students begin to explain
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning.

MGSE4.MD.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

MGSE4.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number e.g., by using a visual such as a number line or area model.

MGSE4.NF.3 Understand a fraction $\frac{a}{b}$ with a numerator >1 as a sum of unit fractions $\frac{1}{b}$.

Social Studies Integration

SS4H4 The student will explain the causes, events, and results of the American Revolution a. Trace the events that shaped the revolutionary movement in America, including the French and Indian War, British Imperial Policy that led to the 1765 Stamp Act, the slogan “no taxation without representation,” the activities of the Sons of Liberty, Daughters of Liberty, and the Boston Tea Party. b. Explain the writing of the Declaration of Independence; include who wrote it, how it was written, why it was necessary, and how it was a response to tyranny and the abuse of power. c. Describe the major events of the Revolution and explain the factors leading to American victory and British defeat; include the Battles of Lexington and Concord, Saratoga, and Yorktown. d. Describe key individuals in the American Revolution with emphasis on King George III, George Washington, Benjamin Franklin, Thomas Jefferson, Benedict Arnold, Patrick Henry, and John Adams. **SS4G2** The student will describe how physical systems affect human systems. d. Explain how each force (American and British) attempted to use the physical geography of each battle site to its benefit (SS4H4c). **SS4CG1** The student will describe the meaning of a. Natural rights as found in the Declaration of Independence (the right to life, liberty, and the pursuit of happiness).

Reading/Writing Integration

ELACC4RL7: Make connections between the text of a story or drama and a visual or oral presentation of the text, identifying where each version reflects specific descriptions and directions in the text.

ELACC4RI7: Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. **ELACC4RI8:** Explain how an author uses reasons and evidence to support particular points in a text. **ELACC4RI9:** Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. **ELACC4W6:** With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting. **ELACC4W8:** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. **ELACC4W9:** Draw evidence from literary or informational texts to support analysis, reflection, and research. a) Apply grade 4 Reading standards to literature.

Space Rover

Materials Needed:

- Old Remote controlled car (any kind!) that still works
- tin foil (or silver paper)
- solar panels
- small motor
- pencils
- Styrofoam
- TV with cable access
- computers with network access
- VCR
- digital cameras
- tape
- scissors
- glue

Before Class:

- Research the terrain of Earth. Have students learn about the different types of landforms generally found on Earth. View topographical maps.

-Assign a salt map for salt dough: 1. mix 2 parts flour 2. 1 part salt and 1 part water. 3. Add a bit more water if it's crumbly. 4. Mold, let dry and paint.

-Discuss the Moon Rover with the students. Students could watch a video of the lunar landing and then discuss the need for the rover.

-Discuss with students the need for rovers, and research Pathfinder and upcoming 2003 Mars Exploration Rover mission. Have students work in groups to research the findings sent back by these rovers.

Rules:

Using a remote controlled car cover with foil.

Using solar panels and the small motor and a pencil you can make radar/transmitter.

Will collaborate with Mr. Figerus