| SUBJECT: Science | GRADE: 6 |
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| **Unit Title: Nature of Science** | **Time Frame: 10 days** |

**UNIT OVERVIEW**

The nature of science is embedded into each unit of study at this grade level. However, it is explicitly instructed as the first unit in 6th grade. Unit competencies focus on the scientific use of models and technology, gathering scientific data, making predictions, and using evidence to explain and reason the way a scientist does.

| LRG SKILLS AND DISPOSITIONS | PA STANDARDS |
|---|---|
| Communication and Empathy 5-8: Communicating predictions, and also using evidence in scientific explanations. (S2B)<br>Critical Thinking and Problem Solving 5-8: Analyzing and interpreting data. (S4B)<br>Adaptability and Flexibility 5-8: Investigations and developing models. (D1B)<br>Resilience and Grit 5-8: Scientific thinking requires resilience and grit. (D4B) | |

| COMPETENCIES | LEARNING TARGETS |
|---|---|
| I can think, reason, and explain the way a scientist does. | |

| SUBJECT: Science | GRADE: 6 |
|---|---|
| **Unit Title: Energy, Forces and Motion** | • **Time Frame: 43 days** |

**UNIT OVERVIEW**

In this unit, students explore the differences between potential and kinetic energy and learn how energy changes form. The unit also focuses on how various forces, such as gravity and friction, impact motion.

| LRG SKILLS AND DISPOSITIONS | PA STANDARDS |
|---|---|
| Collaboration and Teamwork 5-8: Forces Investigations (S1B)<br>Communication and Empathy 5-8: Forces Investigations (S2B)<br>Critical Thinking and Problem Solving 5-8: Paper Airplane Project (S4B)<br>Resilience and Grit 5-8: Paper Airplane Project (D4B) | ASSESSMENT ANCHOR<br>3.2.6-8.G Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.<br>3.2.6-8.H Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.<br>3.2.6-8.I Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.<br>3.2.6-8.J Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of<br>interacting objects.<br>3.2.6-8.K Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.<br>3.2.6-8.L Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass and speed of an object.<br>3.2.6-8.M Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.<br>3.2.6-8.N Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. |

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| | 3.2.6-8.O Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.<br>3.2.6-8.P Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. |
| **COMPETENCIES** | **LEARNING TARGETS** |
| I can show a change in motion of interacting objects can be explained and predicted by forces.<br><br>All forces between objects, regardless of size or direction, arise from only a few types of interactions<br><br>Energy can be modeled as either motion of particles or as being stored in force fields.<br><br>The total change of energy in any system is always equal to the total energy transferred into or out of the system.<br><br>Forces between objects can result in transfer of energy between these objects. | • What do you know about energy, forces and motion?<br>• Why do objects speed up, slow down, or change direction?<br>• How can magnets affect motion?<br>• How can we predict if the motion of an object will change or stay the same?<br>• How can gravity affect the motion of objects on Earth?<br>• How would a ball move if you threw it in space?<br>• What happens to energy when two objects collide?<br>• How do energy transformations inform the design of a roller coaster?<br>• How do people use an understanding of energy, forces, and motion to make predictions and design tools that make the world safe, enjoyable and accessible? |
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| **SUBJECT: Science** | **GRADE: 6** |
| **Unit Title: Corny Days** | **Time Frame: 5 days** |
| **UNIT OVERVIEW** | |

This unit is an experiential field trip to a local farm. During this experience students examine how agricultural products such as corn are used to meet societies' needs through the sustainable use of natural resources.

| LRG SKILLS AND DISPOSITIONS | PA STANDARDS |
|---|---|
| Collaboration and Teamwork 5-8: Corny Days Field Trip (S1B)<br>Communication and Empathy 5-8: Hybrid Animal/Plant Project (S2B)<br>Critical Thinking and Problem Solving 5-8: Corny Days Field Trip Corn Analysis (S4B) | ASSESSMENT ANCHOR<br>3.4.6-8.A Develop a model to describe how agricultural and food systems function, including the sustainable use of natural resources and the production, processing, and management of food, fiber, and energy.<br>3.1.6-8.M Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. |
| **COMPETENCIES** | **LEARNING TARGETS** |
| I can describe how living things, including humans, utilize natural resources in ways that impact agricultural and environmental systems.<br>Offspring resemble, but are not identical to, their parents due to traits being passed from one generation to the next via genes. | • I can develop a model to describe how agricultural and food systems function, including the sustainable use of natural resources and the production, processing, and management of food, fiber, and energy. |

| **SUBJECT: Science** | **GRADE: 6** |
|---|---|
| **Unit Title:** **Electricity, Waves and Information Transfer** | **Time Frame: 65 days** |
| **UNIT OVERVIEW** | |
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| LRG SKILLS AND DISPOSITIONS | PA STANDARDS |
|---|---|
| Collaboration and Teamwork 5-8: Simple Machine Investigations (S1B)<br>Communication and Empathy 5-8: Simple Machine Investigations (S2B)<br>Critical Thinking and Problem Solving 5-8: Simple Machine Theme Park Project (S4B) | ASSESSMENT ANCHOR<br>3.2.6-8.Q Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave<br>3.2.6-8.R Develop and use a model to describe how waves are reflected, absorbed, or transmitted through various materials.<br>3.2.6-8.S Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than<br>analog signals. |
| **COMPETENCIES** | **LEARNING TARGETS** |
| Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave pattern of changing electric and magnetic fields that interact with matter.<br><br>Useful modern technologies and instruments have been designed based on an understanding of waves and their interactions with matter.<br><br>Waves are repeating patterns of motion that transfer energy and information without transferring matter. | 1. What do you know about electricity, waves, and information transfer?<br>2. What is electricity and how is it measured?<br>3. How can components in an electric circuit affect current and voltage?<br>4. How do components in an electrical system transform electrical energy into kinetic energy?<br>5. How can energy transfer be maximized or minimized?<br>6. How can we use models to understand wave properties?<br>7. How do wanes behave when they interact with matter?<br>8. How can we use electricity and waves to communicate?<br>9. How does your body use electrical signals to detect and respond to its environment?<br>10. What have you learned about electricity, waves, and information transfer? |

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| **SUBJECT: Science** | **GRADE: 6** |

| **Unit Title: Solar System** | **Time Frame: 56 days** |
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| **UNIT OVERVIEW** | |
| In this unit, students study the solar system in order to learn about the vastness of space. Throughout the unit, students compare and contrast a variety of celestial bodies, determine the distances between objects and describe how gravity impacts the universe. | |
| **LRG SKILLS AND DISPOSITIONS** | **PA STANDARDS** |
| Collaboration and Teamwork 5-8: Inner and Outer Planet Exploration (S1B)<br>Communication and Empathy 5-8: Solar System Brochure (S2B)<br>Creativity and Innovation 5-8: Solar System Brochure (S3B) | ASSESSMENT ANCHOR<br>3.3.6-8.A Develop and use a model of the Earth sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.<br>3.3.6-8.B Develop and use a model to describe the role of gravity in the motion within galaxies and the solar system.<br>3.3.6-8.C Analyze and interpret data to determine scale properties of objects in the solar system.<br>3.2.6-8.G Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.<br>3.2.6-8.H Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.<br>3.2.6-8.I Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.<br>3.2.6-8.J Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.<br>3.2.6-8.K Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. |
| **COMPETENCIES** | **LEARNING TARGETS** |
| We can infer information about stars based on observations we make from Earth. | • What do you know about how space is explored?<br>• What cycles occur on Earth due to the interactions of the Sun, Earth, and Moon?<br>• Why does Earth have seasons? |

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| Observations of the sky can be explained by predictable patterns of the movement of Earth, moon, sun and planets.<br><br>A change in motion of interacting objects can be explained and predicted by forces.<br><br>All forces between objects, regardless of size or direction, arise from only a few types of interactions. | • Why do patterns in the Moon's appearance occur?<br>• What causes solar and lunar eclipses?<br>• How can models be used to understand the relative size of objects in the solar system and the distances between them?<br>• How does gravity influence our solar system?<br>• How do planets and moons stay in their specific orbits to maintain the structure of our solar system?<br>• What are the criteria and constraints for humans to live in space?<br>• What have you learned about space systems? |

| **SUBJECT: Science** | **GRADE: 6** |
|---|---|
| **Unit Title: Ethics in Disruptive Technologies (AI, 3D Printing, Internet, Cell Phones, etc.)** | **Time Frame: 5 Days** |
| **UNIT OVERVIEW** | |
| Students will select one of the four disruptive technologies (3D printing, AI, Cellphones, Internet) and determine two positive and two negative impacts on the advent of that disruptive technology. The students will select a minimum of five sources with accompanying quantitative data to substantiate their claims. The credibility of each of the documents, articles, or digital resources will be evaluated based on a scoring rubric.. | |
| **LRG SKILLS AND DISPOSITIONS** | **PA STANDARDS** |
| Digital Literacy and Technological Proficiency: Disruptive Technologies (K-DLTP-1) | |
| **COMPETENCIES** | **LEARNING TARGETS** |
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