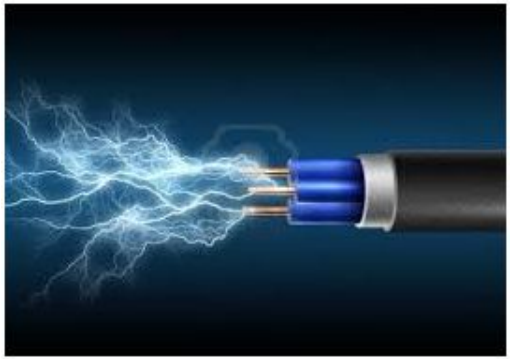
4th Grade Unit 3
9 weeks

Energy



Unit Planning Team:
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Essential Questions

What is energy?

How is energy transferred?

How can energy be used to solve a problem?

Energy

Students who demonstrate understanding can:

4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.]

4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion, light, or sound energy; or, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, and time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]

4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. [Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, or sunlight; non-renewable energy resources are fossil fuels or fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from the burning of fossil fuels.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*.

Science and Engineering Practices

Asking Questions and Defining Problems
Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.
- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3)

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
- Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.
- Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1)
- Apply scientific ideas to solve design problems. (4-PS3-4)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods.
- Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)

Disciplinary Core Ideas

PS3.A: Definitions of Energy
- The faster a given object is moving, the more energy it possesses. (4-PS3-1)
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2, 4-PS3-3)

PS3.B: Conservation of Energy and Energy Transfer
- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2, 4-PS3-3)
- Light also transfers energy from place to place. (4-PS3-2)
- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2, 4-PS3-4)

PS3.C: Relationship Between Energy and Forces
- When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3-3)

PS3.D: Energy in Chemical Processes and Everyday Life
- The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4)

ESS3.A: Natural Resources
- Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)

ETS1.A: Defining Engineering Problems
Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (4-PS3-4)

Crosscutting Concepts

Cause and Effect
- Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1)

Energy and Matter
- Energy can be transferred in various ways and between objects. (4-PS3-1, 4-PS3-2, 4-PS3-3, 4-PS3-4)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology
- Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3-1)

Influence of Engineering, Technology, and Science on Society and the Natural World
- Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1)
- Engineers improve existing technologies or develop new ones. (4-PS3-4)

Connections to Nature of Science

Science is a Human Endeavor
- Most scientists and engineers work in teams. (4-PS3-4)
- Science affects everyday life. (4-PS3-4)

Energy

Background knowledge videos:

PS3A - Definitions of Energy

PS3B - Energy: Conservation & Transfer

PS3C - Energy & Forces

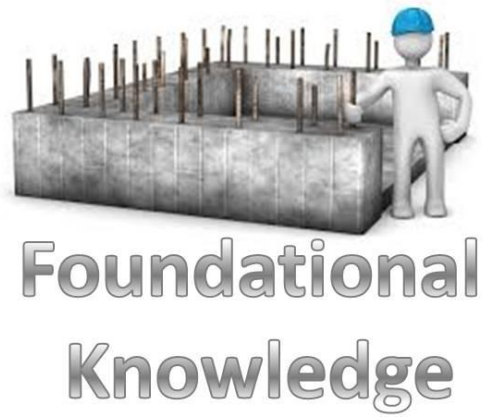
PS3D - Energy in Chemical Processes & Life

ESS3A - Natural Resources

These videos are designed to assist in providing background knowledge with the associated DCI. The information in the videos follows the progression through high school.

Prior to 4th grade, students should have knowledge, understanding of, and experiences with the following ideas:

- ★ When objects touch or collide, they push on one another and can change motion.
- ★ Light travels from place to place and can be redirected.
- ★ Living things need water, air and resources from the land. They live in places that have things they need.
- ★ Humans use natural resources for everything they do.

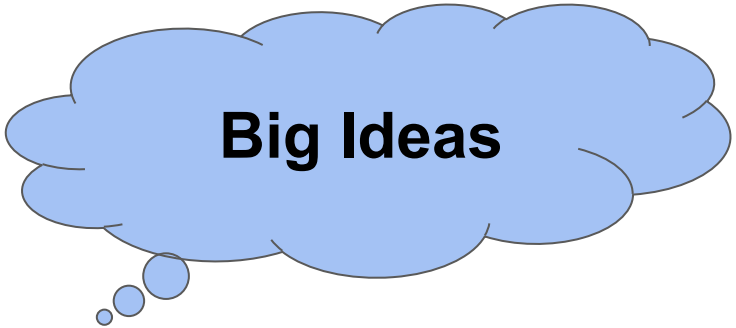


With the implementation of new standards, students may not have had opportunities to engage in these foundational understandings and ideas before 4th grade. You may need to provide opportunities for students to experience these ideas as you move forward.

What is energy?

How is energy transferred?

How can energy be used to solve a problem?



- ★ The faster a given object is moving, the more energy it possesses.
- ★ Energy can be moved from place to place by moving objects or through sound, light, or electric currents.
- ★ Energy is present whenever there are moving objects, sound, light, or heat.
- ★ When objects collide, energy can be transferred from one object to another, thereby changing their motion.
- ★ In collisions, some energy is typically also transferred to the surrounding air, and as a result, the air gets heated and sound is produced.

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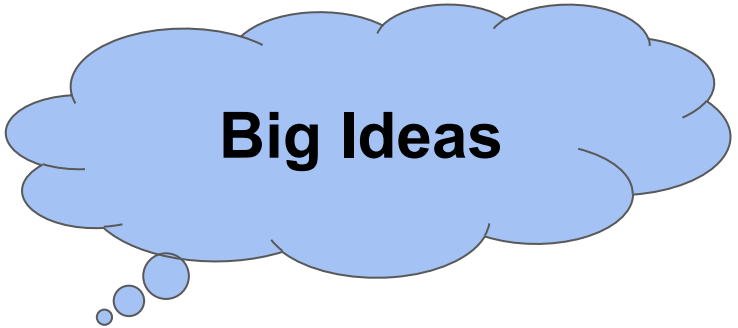

- ★ Light also transfers energy from place to place.
- ★ Energy can also be transferred from place to place by electric currents, which can be used locally to produce motion, sound, heat, or light.
- ★ Currents may have been produced to begin with by transforming the energy of motion into electrical energy.
- ★ The expression “produce energy” typically refers to the conversion of stored energy into a desired form of practical use.
- ★ Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways.
- ★ Some resources are renewable over time, and others are not.

Energy

Students who demonstrate understanding can:

4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.]

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Identify and CLARIFY the STANDARDS

Disciplinary Core Ideas

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PS3.C: Relationship Between Energy and Forces
- When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3-3)

Possible Student Misconceptions:

Misconception: the terms "energy" and "force" are interchangeable.
Energy is the capacity to do work, whereas force is the push or pull that can cause an object to move or stop.

Misconception: When energy changes form, some of the energy is lost for good or destroyed.
Energy is neither created nor destroyed, so when energy changes forms, it may leave a system, but it remains in the world.

Misconception: Windmills are giant fans used to create wind.
Wind provides the energy that moves windmill blades; this mechanical energy can then be converted into other forms of energy such as electricity.

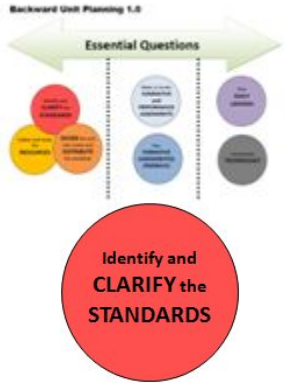
Misconception: Velocity is a force.
Velocity is the rate and direction of the change in the position of an object. It is not a force.

Misconception: If an object is at rest, no forces are acting upon it.
An object with a **zero net force** on it is either at rest or moving with constant speed. An object with a non-zero net force will change its motion. This may involve the object speeding up, slowing down and/or changing direction.

Energy

4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion, light, or sound energy; or, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, and time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]

4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. [Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, or sunlight; non-renewable energy resources are fossil fuels or fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from the burning of fossil fuels.]



Possible Student Misconceptions:

Misconception: An object has a positive charge because electrons are destroyed.

An object becomes positively charged when it loses electrons. The electrons are not really destroyed. They just move to another object, leaving large numbers of atoms that are missing some or all of their electrons.

Misconception: Electricity flows through the wires in a circuit like water flows through a hose.

In an electric circuit, the wires are solid metal. There is not a hole in the center. When electricity flows through wires, the electricity is moving through tiny particles of the metal wire.

Misconception: Heat is a substance that I can feel but not see.

Heat is not a substance. Heat is energy that is transferred from a wamer substance to a cooler substance. When you feel something that is warm, you are feeling heat energy move from the object to your hand.

Disciplinary Core Ideas

PS3.B: Conservation of Energy and Energy Transfer
- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2, 4-PS3-4)

PS3.D: Energy in Chemical Processes and Everyday Life
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Gather and study the RESOURCES

Discovery Education Science Techbook Units

Week	Performance Expectation/ DCI	5E Lesson Plan and Resources
1	**4-PS3-1** Use evidence to construct an explanation relating the speed of an object to the energy of that object. **4-PS3-1.5.1** Energy can be transferred in various ways and between objects. **4-PS3-1.6.1** Use evidence (e.g., measurements, observations, patterns) to construct an explanation. **4-PS3-1.PS3.A.1** The faster a given object is moving, the more energy it possesses. Highlighted items used in District PD session	**DE Forms of Energy 5 minute Teacher Prep: Intro Video Forms of Energy DE Model Lesson** **Options for Lessons:** **Engage:** Begin KLEWS Chart on Energy KLEWS chart KLEWS Chart video KLEWS blank chart Where does the energy we use on Earth come from? Watch the video DE Energy from the Sun (first 53s) Where can we find energy in the world? Watch video DE Energy What examples of energy can you see around you? Watch video DE Examples of Energy **Explore:** What is energy? How is energy stored? What do humans and other organisms do with chemical energy? DE Reading Passages: Counting Calories Power at Sea; DE videos: How our bodies use Energy What is Energy? DE Interactive Exploration: DE Forms of Energy Exploration Student Worksheet Teacher's Guide DE Board: Forms of Energy Board Student Organizer for Note-taking DE Interactive Exploration: Power Up Student Worksheet Teacher's Guide *Read the questions on the student worksheet before you begin, then work your way through the exploration.* **Explain:** DE Interactive Exploration: Energy Makes it Happen Student Worksheet Teacher's Guide DE Reading Passage: Tired from Not Working *Have students list the forms of energy that are mentioned in the passage. Students can then brainstorm in small groups other forms of energy.* **Elaborate:** DE Video Food and Energy *Have each student create a food chain for items on the school lunch menu.* DE Video Garbage In, Power Out *Discuss: What are some ways energy can be transformed from one form to another?* **Evaluate:** DE Forms of Energy Assessment DE Constructed Response Scientific Explanation - CER

Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
2-3	**PS3.A:** Definitions of Energy: The faster a given object is moving, the more energy it possesses. **PS3.A:** Definitions of Energy: Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **PS3.B:** Conservation of Energy and Energy Transfer: Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, **PS3.B:** Conservation of Energy and Energy Transfer: Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced	**Options for Lessons:** **Engage:** What happens to energy when we use it? DE VIdeo: Energy Types and Transformations DE VIdeo: Rollercoaster *Guiding question: Where did the energy to move the roller coaster come from? DE Engage: Identify Energy Transformation - Scroll to the bottom "Identify the energy transformation" William and the Windmill Video Documentary video on the "Boy Who Harnessed the Wind" **Explore:** What happens when energy changes forms? What can happen to stored energy? DE Exploration Changing the Form of Energy Student Worksheet Teacher Guide DE Video Energy from the Sun ***Guiding questions:** What happens to energy after it leaves the Sun? Does it remain sunlight and heat? What else can it become? DE Video Changing Forms of Energy Viewer's Recording Sheet Teacher Guide-Video and Activities DE Video Potential and Kinetic Energy Brain Pop - Kinetic Energy and Potential Energy DE Exploration Set To Go: Potential and Kinetic Energy Student Worksheet Teacher Guide

Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
2-3	**PS3.C:** Relationship Between Energy and Forces: When objects collide, the contact forces transfer energy so as to change the objects' motions. **PS3.D:** Energy in Chemical Processes and Everyday Life: The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. **ETS1.A:** Defining Engineering Problems: Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	**Options for Lessons:** **Explain:** What happens when energy changes forms? What can happen to stored energy? DE Reading Passage and Questions: The Power of Water and Wind DE Video Segments: (Blackline masters and teachers guides are available with both videos, if needed) Rubber Band Toy *watch this segment from larger video* The Law of Conservation of Energy *watch this segment from larger video* **Elaborate:** DE Hands On Lab Wow, Windmills! STEM Activity: Mousetrap Car DE Hands-On Activity: Make a Solar Powered Car DE Hands-On Activity: Collision Course **Evaluate:** DE Constructed Response DE Multiple Choice

Week	Performance Expectation/ DCI	5E Lesson Plan and Resources
4 **PART 1**	**Changing The Speed of Motion** **4-PS3-3** - Ask questions and predict outcomes about the changes in energy that occur when objects collide. **4-PS3-3**.1.1 - Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. **4-PS3-3**.5.1 - Energy can be transferred in various ways and between objects. **4-PS3-3**.PS3.A.1 - Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **4-PS3-3**.PS3.B.1 - Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. **4-PS3-3**.PS3.C.1 - When objects collide, the contact forces transfer energy so as to change the object's' motions.	**Pre-assessment:** *Scroll down the page to - "What do you already know about changing the speed of motion?"* 3 activities/questions to pose for pre-assessment **Changing The Speed of Motion** DE Model Lesson 5 minute teacher prep video ***Guiding Questions:*** *What changes motion?* *How do different forces cause objects to change speed and/or direction?* *Does the force of friction impact an object's motion?* **Options for Lessons:** **Engage:** Thinking about how and why the speed of objects changes: DE Video: Video Fieldtrip: Six Flags Magic Mountain Roller Coaster Colossus DE Video: The Spin of a Pool Ball *How does the movement of a pool cue affect the motion of pool balls?* **Explore:** *What changes motion?* DE Video: Newton's First and Second Laws of Motion *How Do Different Forces Cause Objects to Change Speed and/or Direction?* DE Video: Effects of forces on speed *Does the Force of Friction Impact an Object's Motion?* DE Videos: Friction Zamboni DE Interactives: Making Things Move Student Guide Teacher Guide Changing The Speed of Motion Student Guide Teacher Guide DE Reading Passage: Changing the speed of motion - My Writing Journal DE Hands-On Activty: Car Races Teacher Guide

Week	Performance Expectation/ DCI	5E Lesson Plan and Resources
4 **PART 2**	**Changing The Speed of Motion** **4-PS3-3** - Ask questions and predict outcomes about the changes in energy that occur when objects collide. **4-PS3-3**.1.1 - Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. **4-PS3-3**.5.1 - Energy can be transferred in various ways and between objects. **4-PS3-3**.PS3.A.1 - Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **4-PS3-3**.PS3.B.1 - Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. **4-PS3-3**.PS3.C.1 - When objects collide, the contact forces transfer energy so as to change the object's' motions.	**Options for Lessons:** **Explain:** *What causes the speed of an object to change?* DE Force and Motion Board: Motion, Position, Speed - whole group, or in small groups with chrome books. DE Board: Newton's Laws of Motion Students learn about inertia, speed, velocity, acceleration, and friction with Scholastic StudyJams DE Board Force and Motion (This board is set up as a six day lesson plan...choose activities to use) How can one explain and predict interactions between objects and within systems of objects? How can one predict an object's continued motion, changes in motion, or stability? What is a force? How does a force change the motion of an object? What happens when two unequal forces push an object in the same direction? What happens when two unequal forces push an object in opposite directions? **Elaborate:** Hands-On Activity: 4-wheel Balloon Car After students follow steps 1-10 do the "Try this Next" activity. *What changes the speed of motion?* Try to double the distance by reducing the amount of friction. Also, create friction by using different materials for the surface it travels on (sandpaper, carpet, tile floor, etc.) DE Hands on Lab: Changing Motion Teacher Guide **Evaluate:** DE Changing the Speed of Motion Assessment Constructed Response End of Unit **About Energy** (after teaching weeks 1-4) Moving Pennies Lesson - incoporates concepts learned in the first three weeks About Energy Review Unit Assessment

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5	4-PS3-2.PS3.B.3 - Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. 4-PS3-4 - Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. 4-PS3-4.5.1 - Energy can be transferred in various ways and between objects.	DE Pre-assessment What do you know about electricity? Scroll down "Generating Electricity". This could be assigned to the students through Discovery Ed. **Engage:** DE Video Segment: You and Electricity DE Images: Lightswitch picture Static Electricity Show several pictures of lightning. Ask Where does it come from? Begin a new KLEWS chart on Electricity Klews Chart **Explore:** Ask: *How can people produce electricity?* Use the following Assessment Probes to explore ideas about electricity: *Start with the probe - elicit student thinking - then use the activity from the probe as hands-on exploration of the ideas.* Materials needed: Balloons for each child, different objects to test • Do the Objects Need to Touch? • How Will the Balloons Move? • Can It Be Electrically Charged? • What Happens When you Bring a Balloon Near a Wall? DE Reading passage All Charged Up DE Video Electricity Add information to the Klews Chart.

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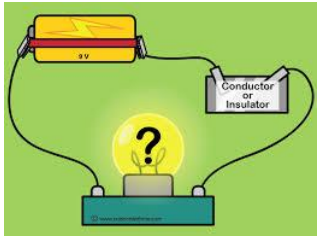
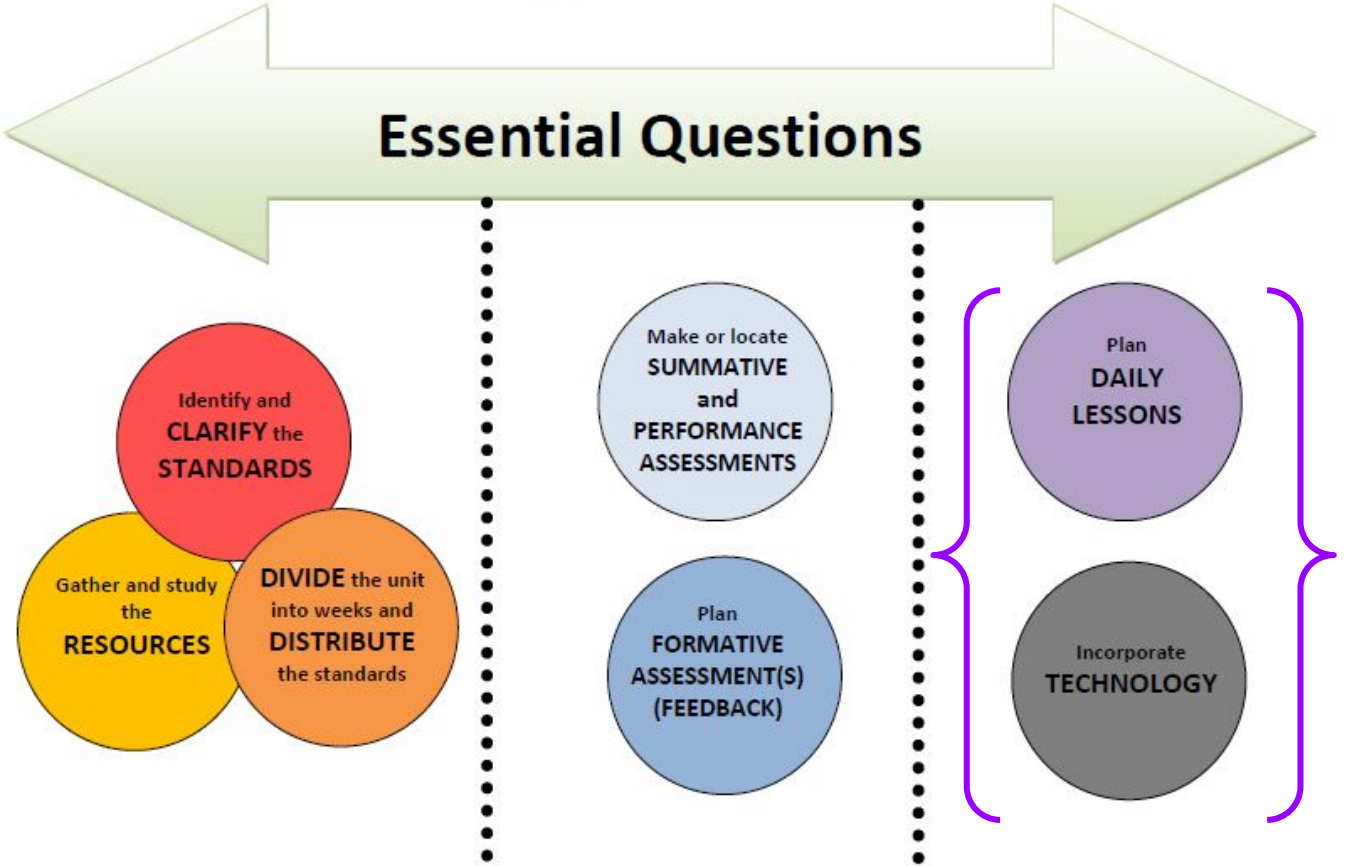
6	**PS3-2.PS3.B.3** - Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. **4-PS3-4** - Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. **4-PS3-4.5.1** - Energy can be transferred in various ways and between objects. **4-PS3-4.6.1** - Apply scientific ideas to solve design problems.	**Engage: How does electricity work?** **Optional Lesson Plan: Create a circuit** Brainpop Video electricity DE Videos: Life Without Electricity Electricity in the Real World **Explore:** Give students the supplies to build a circuit (Don't use the word circuit). Tell them the goal is to make the lightbulb light up. Giving them time to explore is very important. The supplies are: insulated wire, fresh D cell battery, small flashlight bulb. This is the best way to explore. Work in groups of 3 -5. Guiding Question: *How did you get the lightbulb to light?* Have each group draw a picture of what they did to get the lightbulb to work and label the parts. Ask: What have you created? (you want them to get to the understanding that they have created a system) See Thinking Skills- System Analysis Portion Sample System Analysis Lesson **Explain**: Introduce the vocabulary word circuit. Explain that when they made the lightbulb work, they created a circuit. Now ask: Why is the circuit considered a system? Key understanding is that a circuit is a system because all the parts of the circuit must be connected to make it work. Students will watch several resources about circuits listed below. They will "tweet" information that they learned. Tweet Tweet summarizing strategy teacher information video Instruction page **Choose from the videos and passages:** Circuits YouTube (Watch until minute 1:30) DE Video Circuit Jumping a car video YouTube Reading Passage Need a Jump **Elaborate & Evaluate:** Build a series circuit and a parallel circuit *(pages 1-3 only)* Students build series and parallel circuits and answer questions while completing the tasks.

Week	Performance Expectation/ DCI	5E Lesson Plan and Resources
7	**4-PS3-2 -** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. **4-PS3-2.3.1** - Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. **4-PS3-2.5.1** - Energy can be transferred in various ways and between objects. **4-PS3-2.PS3.A.1** - Energy can be moved from place to place by moving objects or through sound, light, or electric currents.	**How can you keep the system working?** **Engage:** Watch this clip from Christmas Vacation and discuss why the lights aren't working. *(clip is edited for use in RPS)*  **Explore:** Have a circuit set out for groups of students. Have a bucket with different objects in it for kids to include in the circuit. The goal is to keep the circuit lit with the objects involved. (They will connect the wire to the different object.) Some items will keep the circuit working, while others won't... **Explain:** Use system analysis to help explain why the system works and doesn't work. Thinking Skills - Systems Analysis Sample System Analysis Lesson Create a chart of objects that kept the electricity flowing and didn't keep it flowing. See example Anchor Chart of conductors and insulators *What do you notice about the items what do they have in common?* DE Videos: Conductors and insulators Circuits, conductors and insulators DE Reading Passage: Conductors and Insulators Add to the Klews Chart...Add *conductors* and *insulators* to the scientific words section. Create a list of other possible conductors (allows electricity to flow through) and insulators (stops the flow of electricity). **Elaborate:** Using the knowledge that they have gained from the explain section, students will decide other objects to test. They will write what the object is and whether it is a conductor or an insulator and why. Optional activity/recording sheet: Conductors and Insulators **Evaluate:** DE Interactive Game: **Race to the Castle** insulators and conductors

Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
8-9 **PART 1**	**4PS3-2** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. **4-PS3-4** Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.	**Thermal Energy** DE Model Lesson Thermal Energy KLEWS Chart **Options for Lessons:** **Engage:** DE Video: How Do You Use Thermal Energy? **The big take away: thermal energy is transferred as heat moving from warmer objects to cooler objects.* DE Video: Thermal and Light Energy **Have students take notes and then add to KLEWS chart for discussion.* DE Video: Heat and Light: Kinds of Energy *Scroll to down to section "What Forms of Energy Can be Sensed?" **Explore:** DE Interactive: Thermal Energy Student Guide Teacher Guide DE Interactive: Melt Off Student Guide Teacher Guide DE Hands-On Activity: Hands On: Solar Water Heater DE Interactive: Hot and Not So Hot Student Guide Teacher Guide Vibration of Molecules Does Color Absorb Heat (Teachers Pay Teachers - Freebie Lesson) Heat Insulators and Conductors Radiant Energy to Thermal Energy Experiment Glow Stick Investigation *Materials for Thermometer Practice and Use:* Fahrenheit Celsius Task Cards (Teachers Pay Teachers - Free Download) Thermometers for Student Practice (Teachers Pay Teachers - Free Download) Make a Practice Thermometer Blank Thermometer Recording Sheet Options: Printables - 3 versions Celsius and Fahrenheit Combined Fahrenheit Blank Thermometer Clip Art

Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
8-9 **PART 2**		**Options for Lessons:** **Explain:** Video: Heat Energy DE Video: All Matter Contains Energy DE Teacher Question/Answer Knowledge DE Text How is Thermal Energy Transferred? *Scroll to section DE Passage Getting to Know Thermal Energy DE Video: Heat, Temperature, Energy DE Cause and Effect Chart **Elaborate:** DE Solve the Problem: Thermal Energy DE Hands On: Thermal Energy Transfer DE Hands On: Build an Insulated Bottle RPS STEM Design Challenge: Pizza Box Solar Oven **Evaluate:** DE How Heat Affects Matter *Scroll to the bottom of this page and look for the corresponding tab. DE Practice Assessment DE Constructed Response PDF Version DE CER Activity Build a Board Have students build a board that demonstrates their learning ACT Aspire-Inspired Assessment - Energy

Backward Unit Planning 1.0



Now you're ready to plan your daily lessons!