

Science—Grade 4 Physical Sciences

| SC.4.2 Waves: Waves and Information | | Access Points | | |
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| Standard/Indicator | Extension | A | B | C |
| SC.4.2.1.A Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength. | Develop a simple model to describe patterns in the relative height (amplitude) and length (wavelength from peak to peak) of waves, and to recognize that waves can move objects. | Use a simple model to identify patterns in the relative height (amplitude) and length (wavelength from peak to peak) of waves (sound, light, or visible wave moving through a material), and to recognize that waves can move objects. | Use models to compare the relative height or length of waves and the distance an object will move (e.g., which wave will cause an object floating water to move a greater distance, up and down, side to side). | Recognize a wave in water and/or that a wave in water can move an object. |

Standard Clarification

Students will use or develop a model to describe patterns in the height (amplitude) and length (wavelength) of waves. Students will label parts of a model of a wave and make comparisons within the model. Students will recognize that waves can move objects.

Target Activities for Access Point A

- A.** Students use or develop a model of a wave to describe the pattern of the wave (i.e., amplitude or wavelength) and identify whether an object is being moved by the wave.
- use a model to identify the amplitude and wavelength of various waves (e.g., sound wave, light wave)
 - observe a sound wave gif or other model of a sound wave and identify the pattern of the sound wave
 - observe a picture of an object hitting water (e.g., a rock thrown in a lake) and describe what happens
 - create a model of sound waves after a tuning fork is hit by the person holding it
 - create a model of sound waves after a tuning fork is hit and another tuning fork is nearby
 - use a parachute with handles or a blanket to create large and small waves. Draw models of the different waves created and label the parts of the wave (e.g., peak, wavelength, amplitude). Repeat the activity with other objects (e.g. jump rope, extension cord). Discuss the up and down pattern of a wave and make comparisons in the size of the waves using wave terminology (e.g., peak, wavelength, amplitude).

Scaffolding Activities for Access Points B and C

- B.** Students compare the size of waves to the distance an object moves.
- fill an aquarium with water, and use a tool to create waves to move a small floating object (e.g., table tennis ball, toy boat, rubber duck) across the water.
 - pour water from a pitcher at varying speeds to create larger or smaller waves to compare how the floating objects move in the water
 - watch videos of boats floating in large bodies of water and compare how a boat moves on the water on a relatively calm day (e.g., few, smaller waves) versus a very windy day (e.g., more, larger waves)
 - watch videos of people surfboarding and discuss how the waves carry the surfers across the water
- C.** Students recognize that waves cause objects to move in water.
- fill a large container with water and explore different ways to make the water move (e.g., stir with a stick, drop different size objects into the water, shift the container from side to side, blow on the water through a straw)
 - place a floating object in a large container of water and make waves to move the object from one side of the container to the other
 - identify a wave in water when given a container of water with a wave or without a wave

Prerequisite Skill: Students compare the lengths and heights of objects.

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| | <ul style="list-style-type: none"> ● compare the lengths of pieces of string, noodles, or pencils, and select the longest or shortest ● compare the heights of buildings, trees, or tables, and select the tallest or shortest ● order objects to show increasing or decreasing lengths or heights |
| Key Terms | amplitude, distance, energy, float, height, length, model, movement, object, pattern, peak, speed, tool, wave (e.g., sound, light, visible wave), wavelength |
| Additional Resources or Links | <p>This is an animated wave showing the pattern of amplitude and wavelength. https://commons.wikimedia.org/wiki/File:Cochlea_wave_animated.gif</p> <p>This is an article for students about energy waves. https://theconversation.com/curious-kids-how-do-ripples-form-and-why-do-they-spread-out-across-the-water-120308</p> <p>This is a video about waves and wave properties. https://www.generationgenius.com/videolessons/wave-properties-video-for-kids/</p> <p>This is a lesson about energy and how waves can move objects. https://ngss.nsta.org/Resource.aspx?ResourceID=200</p> |
| Cross-Content Standards | <p>Language Arts: Identify How Events Relate (4.RI.2), Use Text Features (4.RI.4), Answer Literal Questions (4.RI.6), and Identify Appropriate Print and Digital Sources (4.W.6.b)</p> <p>Mathematics: Identify Inches or Feet Using a Model of a Ruler (4.3.3.c)</p> |

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| Standard/Indicator | Extension | A | B | C |
| SC.4.2.1.B Generate and compare multiple solutions that use patterns to transfer information. | Observe and gather information about ways that humans use patterns to send or receive information across a distance and generate or compare solutions used in different conditions. | Given ways that humans use patterns (e.g., lights, sounds, numbers, letters, colors, symbols, flags) to send or receive information across a distance, compare their use in different conditions (e.g., darkness/daylight, fast/slow, rainy/windy/dry, near/far). | Given a pattern used to send or receive information, identify conditions in which it could and could not be used. | Identify a pattern used to send or receive information as light, sound, or symbols. |
| Standard Clarification | | | | |
| Students will compare the ways people use patterns to send and receive information across a distance in different conditions. The activities for this extension may need to be modified depending on the communication needs and abilities of the individual students. | | | | |
| Target Activities for Access Point A | | | | |
| <p>A. Students compare different ways people communicate and their effects under different conditions.</p> <ul style="list-style-type: none"> ● generate a list of different ways (e.g., words, hand gestures, writing, speech generators) of getting someone’s attention, communicating “come here,” asking for help, saying “OK,” or communicating another appropriate messages typically used during the school day ● use the ideas on the generated list to practice communicating in each way, using various scenarios and situations (e.g., noisy/quiet environment, dark/light environment, crowded/empty environment) ● match the ideal form of communication to each environment (e.g., hand gestures are not appropriate to use in a dark room, but talking is) ● play the game Telephone and conduct an investigation to find the best way to communicate the secret word(s) around the circle ● identify the various forms of communication used throughout the classroom and school (e.g., talking, sign language, gestures, speech generators) and how they are used ● watch a video, and discuss different forms of communication in familiar work or social spaces and whether the forms of communication are successful (e.g., construction workers use flashing lights and signs to warn of construction work in an area) | | | | |
| Scaffolding Activities for Access Points B and C | | | | |
| <p>B. Students identify ideal conditions and limitations under which it is best to use certain communication methods.</p> <ul style="list-style-type: none"> ● identify different times of the school day when appropriate to greet a person using sound (e.g., verbally) versus greeting someone with no sound (e.g., eye contact, smile, head nod) ● generate a list of conditions when sounds are used as a warning (e.g., a vehicle backing up, an elevator beeping when the door is opening or closing, emergency vehicles approaching, someone leaving a store before paying for an item) ● watch a video showing an air traffic controller using hand signals to communicate with a pilot; display a poster showing the different hand signals that are used; mimic the hand signals with hands only and then with a | | | | |

flashlight in a darkened classroom; discuss why hand signals are necessary for an air traffic controller to use when communicating with a pilot

C. Students identify whether light, sound, or symbols were used to send or receive information.

- watch traffic videos or collect pictures showing examples of lights or sound used for communicating (e.g., turn signals, brake lights, traffic lights, flashing warning lights, honking horn)
- discuss why sounds and lights are used for a fire alarm and on emergency vehicles
- play a memory-style game using common community symbols and signs, and identify the meaning of each symbol or sign
- listen to songs with different tempos and speeds (e.g., happy and upbeat, quiet and slow), and discuss what each song feels like or what message it conveys, using sentence starters or pictures (e.g., This song makes me feel _____.)

Prerequisite Skill: Students understand and use nonverbal gestures to communicate.

- clap hands to applaud
- wave hello or goodbye
- shake head to indicate yes or no
- move right, left, go, or stop in response to hand signals

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| Key Terms | communication, compare, conditions, dark, distance, generate, information, light, pattern, receive, send, sign, solution, sound, symbol |
| Additional Resources or Links | <p>This is a table that shows four different communication modes and the advantages and disadvantages under certain situations. https://betterlesson.com/lesson/resource/3274499/comparing-codes-key</p> <p>This is a poster that shows hand signals air traffic controllers use. https://www.cfinotebook.net/graphics/aircraft-operations/terminal/hand-and-arm-signals/standard-hand-signals.jpg</p> <p>This is an activity that teaches students to send and decipher Morse Code using flashlights. https://ngss.nsta.org/Resource.aspx?ResourceID=202</p> <p>This is an interactive lesson where students generate and compare solutions for transmitting information. https://ngss.nsta.org/Resource.aspx?ResourceID=980</p> |
| Cross-Content Standards | <p>Language Arts: Identify Central Idea and Key Detail (4.RI.1) and Identify Patterns of Events (4.RI.7)</p> <p>Mathematics: Identify Representations of Numbers (4.1.1.a), Identify Odd and Even Numbers (4.1.1.a), and Skip Count Using Numbers, Models, or Objects (4.1.1.d)</p> |

Science—Grade 4 Physical Sciences

| SC.4.4 Energy: Conservation and Transfer | | Access Points | | |
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| Standard/Indicator | Extension | A | B | C |
| SC.4.4.2.A Use evidence to construct an explanation relating the speed of an object to the energy of that object. Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy. | Use evidence from observations, scenarios, or data to explain the relationship between the relative speed and energy of an object. | Given evidence from observations, scenarios, or data, describe the relationship between the relative speed and energy of an object (objects with greater speed have more energy than objects with less speed). | Given the speed of two or more objects, identify which has the most/least energy, or given the energy of two or more objects, identify which has the fastest/slowest speed. | Given the same object moving at different speeds, identify when it has more/less energy. |

Standard Clarification

Students will examine evidence of the relative speed of an object and understand that the faster an object is moving, the more energy it possesses.

Target Activities for Access Point A

- A.** Students use evidence in order to explain the relationship between the relative speed and energy of an object.
- observe a video about bowling that includes people of various abilities (e.g., children with lightweight bowling balls that move slowly and professional bowlers with heavier bowling balls that move faster), and discuss who will knock more pins down and which ball has more energy and why (more mass and more speed means more energy)
 - use data from an investigation of a car going down a ramp at different speeds to explain that the car has more energy when it goes faster

Scaffolding Activities for Access Points B and C

- B.** Students identify an object with more or less speed.
- observe a video of three objects rolling down a ramp at the same time to determine which object has less speed
 - measure the speed of a toy car when it is pushed with a light force, with a medium force, and with a greater force to determine which force causes the toy car to go the fastest
- B.** Students identify an object with more or less energy.
- experience the difference in airflow when a fan is at a low speed versus a high speed
 - experience and discuss why the same person becomes tired faster when running versus when walking slowly over the same distance (comparison should ask, “When did the person use more energy?”)
 - compare the difference a person feels when walking up a set of stairs or an incline versus walking the same distance on a flat surface (comparison should ask, “Which person feels like they used more energy?”)
- C.** Students identify that movement is a form of energy and when a moving object has less energy and when it has more energy.
- observe an object in motion (e.g., scooter moving across the floor) and the same object at rest, and identify that the object in motion is an example of energy
 - watch a video about energy, and identify movement as one form of energy
 - observe a ball rolling down an inclined plane at two different speeds, and identify that the ball rolling faster has more energy or that the ball rolling slower has less energy

- observe a flying disc being thrown across a playground, and determine whether it has more or less energy than a flying disc that is not thrown
- observe two identical balls rolling down a hallway, and identify that the faster ball has more energy or that the slower ball has less energy

Prerequisite Skill: Students discriminate between fast and slow.

- wave a flag or streamer fast or slow on command
- clap hands or stomp feet fast or slow on command

Prerequisite Skill: Students discriminate between more and less.

- compare buckets of water and indicate which has more or less water
- compare stacks of paper or books and indicate which pile has more or less

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| Key Terms | energy, evidence, fast, less, more, object, relative speed, slow |
| Additional Resources or Links | <p>This is a unit on potential and kinetic energy that includes a video and investigations that can be used in the classroom. https://tpt.pbslearningmedia.org/resource/d8f7ac49-c371-4b49-995f-88abd55e651c/kinetic-potential-energy-diy-science-time/</p> <p>This is a video that tests three different objects (hollow ball, solid ball, tin can) rolling down a ramp simultaneously. https://www.youtube.com/watch?v=jaqS5dJlrjY</p> |
| Cross-Content Standards | <p>Language Arts: Answer Literal Questions (4.RI.6) and Use Precise Words, Phrases, and Descriptive Details (4.W.3.b)</p> <p>Mathematics: Use Symbols $>$, $<$, and $=$ to Compare (4.1.1.f)</p> |

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| SC.4.4 Energy: Conservation and Transfer | | Access Points | | |
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| Standard/Indicator | Extension | A | B | C |
| <p>SC.4.4.2.B Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electrical currents. Assessment does not include quantitative measurements of energy.</p> | <p>Use observations as evidence that energy can be transferred from place to place by sound, light, heat, and electrical currents.</p> | <p>Identify evidence that energy can be transferred from place to place by sound, light, heat, and electrical currents (e.g., sound from a radio vibrates a window, light from a flashlight illuminates a spot across the room, heat from the Sun warms a bench, electricity powers an appliance).</p> | <p>Given evidence that energy is transferred from one place to another, identify if the energy transfer was by sound, light, heat, or electrical currents.</p> | <p>Given an electrical device, recognize that energy is only transferred to the device when it is turned on.</p> |
| Standard Clarification | | | | |
| Students will use observations to identify that energy is transferred from one place to another by sound, light, heat, and electrical currents. | | | | |
| Target Activities for Access Point A | | | | |
| <p>A. Students identify evidence that energy can be transferred from one place to another place by various methods.</p> <ul style="list-style-type: none"> ● observe various surfaces found outside (e.g., slide, tabletop, sidewalk) during a sunny day, and identify how the surface gets hot (i.e., heat from the sun is transferred to the surface) ● describe how the sound from very loud sounds (e.g., music, thunder, train going by) can cause objects nearby to vibrate ● observe an unplugged lamp that does not turn on, and then observe the same lamp plugged in to explain how electrical energy is transferred from electricity to the lamp ● explain what is happening when you sit next to a heat source (e.g., space heater transfers heat to you) ● describe how the light from a flashlight can illuminate a spot across the room ● watch a cooking safety demonstration, and then explain why the metal handle of a pot of hot water on the stove gets hot ● watch video of ways energy is transferred from one object to another | | | | |
| Scaffolding Activities for Access Points B and C | | | | |
| <p>B. Students identify the transfer of energy as sound, light, heat, or electrical currents.</p> <ul style="list-style-type: none"> ● identify the difference(s) between an unplugged pencil sharpener and the same pencil sharpener that is plugged in and sharpening pencils (e.g., it makes noise, it has electricity to sharpen the pencils) ● watch a video of a fire truck with the siren turned on and a fire truck without the siren on, and identify that the siren is an example of sound energy being transferred from the fire truck to your ears ● sort pictures of electrical devices (e.g., fan, vacuum cleaner, alarm clock, toaster, pencil sharpener, iron, hair dryer, television) into groups based on the evidence of the energy transfer (i.e., sound, light, heat, or electrical currents) ● watch a video of chocolate pieces melting in a pan, and identify that this is an example of heat energy being | | | | |

transferred to the chocolate pieces

- observe an image of a car being driven at night with the headlights on, and identify that the headlights are an example of light energy being transferred to your eyes
- identify light and sound as two ways an alarm clock transfers energy

C. Students identify motion, heat, light, and sound as evidence of energy.

- identify a plugged-in vacuum cleaner as receiving energy when it is turned on
- observe a difference between a toaster when the button is pushed down or turned on and when the button is not pushed down
- observe a difference when a blow dryer is turned on and turned off
- observe a difference when a fan is turned on and turned off
- identify that when a toy is turned off it has no transfer energy

Prerequisite Skill: Students identify cause-and-effect relationships.

- identify a cause-and-effect relationship in a given scenario
- identify a possible effect to a given event (e.g., an effect of eating an ice-cream cone outside in the summer)
- identify melting as change from a solid to a liquid

Prerequisite Skill: Students recognize one or more forms of energy.

- recognize that the sound from an emergency vehicle is a form of energy
- recognize that the light shining from a lamp is a form of energy
- recognize that the heat from an oven is a form of energy
- recognize that the electricity from plugging in an electrical device (e.g., television, video game console) is a form of energy

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| Key Terms | device, electrical current, electricity, energy, heat, light, melt, melting, senses (i.e., hearing, seeing, feeling, smelling, tasting), sound, transfer, vibrate, vibration |
| Additional Resources or Links | <p>This is a video showing the transfer of energy from heat, light, sound, and electricity to other objects. https://www.generationgenius.com/videolessons/energy-transfer-video-for-kids/</p> <p>This is a video of a fire truck with a loud siren. https://www.youtube.com/watch?v=gxbGMkhrkZM</p> <p>This is a video showing chocolate pieces getting put into a pan and then melting. https://www.youtube.com/watch?v=p4X2QRh-di8</p> <p>This is a photo of a car with the headlights on being driven down a road at night. https://commons.wikimedia.org/wiki/File:2005_winter_road_full_beam.jpg</p> |
| Cross-Content Standards | <p>Language Arts: Identify Central idea and/or Key Details (4.RI.1), Identify Related Events (4.RI.3), Use Text Features (4.RI.4), Identify Event Patterns (4.RI.7), and Identify Facts (4.W.4.b)</p> <p>Mathematics: Interpret Information on a Line Plot (4.4.1.a)</p> |

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| SC.4.4 Energy: Conservation and Transfer | | Access Points | | |
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| Standard/Indicator | Extension | A | B | C |
| SC.4.4.2.C Ask questions and predict outcomes about the changes in energy that occur when objects collide. Assessment does not include quantitative measurements of energy. | Observe and gather information to describe evidence of a change in energy, in one or both objects, when one object collides with another. | Observe results of two objects colliding with each other and identify evidence that indicates a change of energy in one or both objects (e.g., starts/stops moving, changes direction, changes speed). | Given a collision between two objects, identify whether there was a change in energy in one or both objects. | Recognize a change in energy in an object (e.g., starts/stops moving, changes direction, changes speed). |
| Standard Clarification | | | | |
| Students will observe a change in energy when two objects collide and describe how the energy changed for one or both of the objects. There is evidence of a change in energy when an object starts/stops moving, changes direction, or changes speed. | | | | |
| Target Activities for Access Point A | | | | |
| <p>A. Students observe objects colliding and describe the change of energy in one or both objects.</p> <ul style="list-style-type: none"> ● watch two large outdoor balls roll toward each other and collide, and then describe the change in energy ● watch a video of a toy car colliding with a pile of stationary cars, and describe the change of energy in both sets of cars ● slide two blocks across a table into each other at different angles (e.g., head on, T-bone collision, one hitting the back corner), and discuss the change in energy in one or both objects ● make predictions of what will happen when two objects collide ● indicate the evidence of the change of energy from a bowling ball hitting and knocking down the bowling pins | | | | |
| Scaffolding Activities for Access Points B and C | | | | |
| <p>B. Students identify the change of energy of one object when two objects collide.</p> <ul style="list-style-type: none"> ● identify what will happen to a baseball when a baseball bat hits a baseball that is pitched ● identify what change will happen to a Frisbee when it is thrown and hits a wall ● watch a video of a volleyball player blocking a ball coming over the net, and identify the change of energy between the ball and the player ● identify what happens to bowling pins when a bowling ball is rolled down a ramp ● observe a pencil being dropped from up high and hitting the ground, and discuss the change of energy in the pencil at first contact with the ground <p>C. Students identify what happens to a small moving object when it collides with a large stationary object.</p> <ul style="list-style-type: none"> ● observe a toy car being pushed into a wall, and identify one thing that happens to the toy car ● observe a tennis ball rolling into the leg of a desk, and discuss what happens when the tennis ball hits the leg of the desk ● observe a crayon being pushed or rolled across a desk and colliding with a large textbook, and identify what happens to the crayon before and after the collision | | | | |
| Prerequisite Skill: Students understand the meanings of “moving” and “not moving.” | | | | |

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| | <ul style="list-style-type: none"> ● identify moving things in the classroom ● sort pictures into categories of moving and not moving, and changing direction |
| Key Terms | change, collide, decreases, direction, energy, evidence, increases, object, speed |
| Additional Resources or Links | <p>This is a video that shows the change of energy when objects collide. https://www.generationgenius.com/videolessons/collisions-video-for-kids/</p> <p>This is a video that shows different toy cars crashing into a pile of toy cars. https://www.youtube.com/watch?v=t6cBz-8hNPQ</p> <p>This is a video that shows two small children running toward each to demonstrate the energy change when they crash into each other. https://www.youtube.com/watch?v=g5ojJA6SHtg</p> <p>This is a video that shows how different objects move when they collide. https://www.youtube.com/watch?v=e-ICxoZH8lw</p> <p>This is a 12-unit about how motion energy changes in a collision. https://ssec.si.edu/collisions</p> |
| Cross-Content Standards | <p>Language Arts: Identify How Events Are Related (4.RI.2), Identify Patterns of Events (4.RI.7), Use Descriptive Language (4.W.3.b), and Identify Supporting Facts (4.W.4.b)</p> <p>Mathematics: Addition and Subtraction (4.2.3.a), Identify Lines (4.3.1.c), and Identify Inches or Feet in a Ruler (4.3.3.c)</p> |

Science—Grade 4 Physical Sciences

| SC.4.4 Energy: Conservation and Transfer | | Access Points | | |
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| Standard/Indicator | Extension | A | B | C |
| SC.4.4.2.D Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. 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. | Participate in designing, testing, or using a simple common device to describe the conversion of energy from one form to another. | Given information about a simple common device, describe the conversion of energy from one form to another (e.g., a bulb converts electricity to light and heat, a doorbell converts electricity to sound). | Given a common electrical device, identify one or more forms of energy that electricity is converted into (e.g., motion, heat, light, sound). | Given two common devices, identify which device uses electricity to function. |
| Standard Clarification | | | | |
| Students will discuss the ways a common device converts energy from one form to another, after designing, testing, or using the device. | | | | |
| Target Activities for Access Point A | | | | |
| <p>A. Students participate in designing, testing, or using a simple common device to describe the ways the device uses one kind of energy and converts it to a different form of energy.</p> <ul style="list-style-type: none"> observe bread being toasted in a toaster, and create a chart showing the conversion of energy within the toaster (i.e., a toaster is plugged in and converts electricity into heat, which then toasts the bread) create a before-and-after visual showing what happens to a lamp before it is plugged in to an electrical socket and after (i.e., it turns on), and discuss the change and the conversion of energy the action produces watch a video about common devices that show a conversion of energy when used, and then pair pictures of the devices with the correct word cards (e.g., doorbell picture with a word card that says “electricity to sound”) | | | | |
| Scaffolding Activities for Access Points B and C | | | | |
| <p>B. Students identify the form of energy that electricity is converted into when using a common electrical device.</p> <ul style="list-style-type: none"> participate in a scavenger hunt to find devices in the classroom that convert electricity into light (e.g., light bulbs), heat (e.g., space heater), motion (e.g., fan), and sound (e.g., radio, headphones) create a collage or other visual that shows devices that convert electricity into another form of energy (e.g., electric car, paper shredder, oven/stove) <p>C. Students identify common devices that use electricity.</p> <ul style="list-style-type: none"> compare two devices that perform the same function, one device that uses electricity and one that does not (e.g., electric mixer/whisk, motorized/nonmotorized wheelchair, vacuum/broom), and identify which device uses electricity perform a task with and without electricity (e.g., mix cake batter by hand and use an electric mixer), and identify which one uses electricity | | | | |
| Prerequisite Skill: Students recognize common electrical devices and their purpose. | | | | |
| <ul style="list-style-type: none"> choose the correct device between two choices (e.g., electric mixer, electric pencil sharpener) when asked which device is used to mix cake batter choose the correct device between two choices (e.g., lamp with light bulb, paper shredder) when asked which device is used to create light | | | | |

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| <p>Prerequisite Skill: Students identify the use of electrical energy.</p> <ul style="list-style-type: none"> compare two common devices that use electrical energy (e.g., computers), and identify when they are using electrical energy (e.g., when they are plugged in and charging or when they are off) | |
| <p>Key Terms</p> | <p>computer, conversion, design, device, electrical, electricity, energy, function, heat, light, motion, sound, test</p> |
| <p>Additional Resources or Links</p> | <p>This is a video on energy conversion and electricity. https://www.generationgenius.com/videolessons/energy-transfer-video-for-kids/</p> <p>This is a lesson plan about energy conversion, that is part of a larger unit on energy. https://www.teachengineering.org/lessons/view/ucd_energy_lesson03</p> <p>This is a video defining different types of energy. https://tpt.pbslearningmedia.org/resource/863dd4e0-d4df-4a1c-b3df-54c98c3b92e2/what-is-energy-young-explorers/</p> <p>This is a lesson plan on energy transformation. https://keslerscience.com/energy-transformation-lesson-plan-a-complete-science-lesson-using-the-5e-method-of-instruction/</p> |
| <p>Cross-Content Standards</p> | <p>Language Arts: Identify Individuals or Events (4.RI.2), Use Text Features (4.RI.4), Answer Questions (4.RI.6), Use Context Clues (4.V.1.a), Use Descriptive Language (4.W.3.b), and Identify Facts (4.W.4.b)</p> <p>Mathematics: Interpret Information in a Line Plot (4.4.1.a) and Solve a Problem with Addition or Subtraction Using a Line Plot (4.4.2.a)</p> |

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| SC.4.4 Energy: Conservation and Transfer | | Access Points | | |
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| Standard/Indicator | Extension | A | B | C |
| SC.4.4.2.E 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. | Participate in scientific testing of common devices that use energy to determine whether the device meets stated needs and/or identify potential improvements. | Given the results of scientific testing of a common device, identify whether the device meets stated needs and/or identify potential improvements. | Given the results of testing two devices, determine which device better meets the stated need. | Given a device, identify whether or not the device meets a stated need. |
| Standard Clarification | | | | |
| Students will use results from tests on a common device that uses energy to decide if the device meets the need and, if not, identify ways to improve the device. | | | | |
| Target Activities for Access Point A | | | | |
| <p>A. Students use observations or data from investigations to identify whether the testing of a device indicates that the device meets the needs.</p> <ul style="list-style-type: none"> ● identify a device that meets the need of heating up or cooling down a room (e.g., space heater, fan), and participate in an investigation to determine whether the device is meeting the intended need ● use data from an investigation on using a specific type of floor-cleaning device (e.g., long, wide broom; toy-sized broom) to determine whether the device is meeting the intended need ● participate in an investigation to determine whether a two-slice toaster is useful in a cooking class <p>A. Students identify how to improve a device after learning of testing results.</p> <ul style="list-style-type: none"> ● determine that a small shovel is not very helpful in removing snow after a large snowstorm, and identify one or more improvements that may help meet the need of removing large amounts of snow (e.g., use a wider shovel, use a snowblower) ● determine that the current recycling box in the classroom is not helpful because it is too small and hard to carry to the school recycling bin, and identify one or more improvements that may help meet the need of making class recycling easier (e.g., use a larger box, add wheels to the box so it is easier to move to the school recycling bin) ● identify problems with commonly used devices and pair them with pictures or text that states a potential improvement to the device (e.g., small, overflowing recycling bin vs. large recycling bin; small, short snow shovel vs. snow blower) | | | | |
| Scaffolding Activities for Access Points B and C | | | | |
| <p>B. Students compare devices that perform similar functions.</p> <ul style="list-style-type: none"> ● compare a variety of alarm clocks (e.g., electric, battery operated, mobile device, wind-up clock), and discuss the advantages and limitations of each type of device ● compare a two-slice toaster with a toaster oven to identify which is better and easier to use when making toast in a life skills class ● compare a sack (or another device that requires carrying or lifting to move) and a cart (or another device that requires pulling or pushing to move) to determine which method is better in transporting large and heavy items, such as groceries ● identify which device (tool) would be better to use in a specific scenario when given two choices (e.g., tent camping: a battery-operated alarm clock vs. an electric alarm clock; large grocery order: a shopping bag vs. a cart) <p>C. Students identify devices (tools) that meet given needs.</p> | | | | |

- create a visual display or collage of all the devices that could be used to meet the need of temperature control (i.e., cooling and heating)
- create a visual display or collage of all the devices that could be used to heat food for meal preparation (e.g., microwave, stove) and cool food for storage (e.g., refrigerator, cooler)
- choose the necessary tool(s) to use when preparing cold cereal to eat for breakfast
- choose which device(tool) works better for watching movies when given two choices (e.g., a large screen TV and a cellphone)
- determine whether a smart board or other interactive device (tool) is beneficial to use during a morning meeting weather report

Prerequisite Skill: Students recognize appropriate tool(s) for a project.

- choose cooking tools (e.g., spatula, mixing spoon) over writing tools (e.g., pencil, pen) when asked what is needed for cooking or baking
- match one or more tools to a picture of an activity

Prerequisite Skill: Students recognize when something needs to be changed or adjusted.

- recognize that a shirt or other piece of clothing is on inside out or backwards
- recognize that the student's name is presented incorrectly (e.g., missing letters, wrong symbol, wrong sign)
- identify when the daily schedule is incorrect or missing something

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| Key Terms | device, helpful, improvement, need, scientific testing, tool |
| Additional Resources or Links | <p>This is a book about a tin can phone. https://my.nsta.org/resource/1140</p> <p>This is a science experiment that asks the students to improve a sand castle so it supports more weight without falling apart. https://www.sciencebuddies.org/science-fair-projects/project-ideas/CE_p031/civil-engineering/how-much-weight-can-your-sandcastle-hold</p> |
| Cross-Content Standards | <p>Language Arts: Identify Central Idea and/or Key Detail (4.RI.1), Identify Related Events (4.RI.2), and Answer Questions (4.RI.6)</p> <p>Mathematics: Interpret Information in a Line Plot (4.4.1.a) and Solve a Problem with Addition or Subtraction Using a Line Plot (4.4.2.a)</p> |

Science—Grade 4 Physical Sciences

| SC.4.4 Energy: Conservation and Transfer | | Access Points | | |
|--|--|--|--|--|
| Standard/Indicator | Extension | A | B | C |
| SC.4.4.2.F Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment. | Observe and gather information about different types of energy or fuel used within the community, to describe what natural resources they come from and how their uses affect the environment. | Given information about a certain type of energy or fuel used within the community, identify the natural resource it comes from (e.g., coal, oil, natural gas, corn, wood, solar, wind) and how its use affects the environment (e.g., pollution, land use). | Given a certain type of energy or fuel used within the community, identify the natural resource it comes from. | Given two vastly different natural resources, identify which is used for energy or fuel. |

Standard Clarification

Students will identify and describe natural resources within the community that can be used to create different types of energy or fuel. Students will also identify how the uses of the energy or fuel affect the environment.

Target Activities for Access Point A

- A.** Students use information about types of energy or fuel used within the community, and identify what natural resource it comes from.
- after watching a video, identify one or more types of energy or fuel used within the local or state community (e.g., solar energy, wind energy, coal)
 - after watching a video about natural resources, match a type of energy or fuel used within the local or state community with the natural resource it is made from (e.g., solar energy comes from the Sun, certain types of fuel comes from corn or other crops)
 - observe pictures or real-world examples of solar panels and wind turbines, and identify what those objects are used for and how they work (e.g., solar panels convert the Sun's energy into electricity, wind turbines convert wind energy into electricity)
- A.** Students use information about types of energy or fuel used within the community, and identify how the use of the energy or fuel affects the environment.
- observe pictures or watch videos about types of energy or fuel used within the local or state community and what the energy or fuel is made from, and determine whether there is an impact on the local or state environment (e.g., burning coal and gasoline creates air pollution)
 - complete a chart that shows a type of energy or fuel used within the local or state community and the natural resource the energy or fuel comes from, and match or draw a picture of one possible impact on the environment

Scaffolding Activities for Access Points B and C

- B.** Students identify the natural resource that a type of energy or fuel used within the local or state community comes from.
- read or listen to an article about types of energy or fuel used in the local or state community
 - create a collage or other visual and matching pictures of types of energy or fuel used within the local or state community and the natural resources they come from (e.g., fuel for cars comes from local crops)
 - participate in investigations that model different types of energy or fuel used in the local or state community,

and identify the type of natural resource used to create the energy or fuel (e.g., create a small wind turbine and put it outside to see what happens)

C. Students identify which natural resource is used for fuel.

- identify one way fuel is used in daily life (e.g., gasoline in a car)
- watch a video about ways fuel is made, and identify a natural resource that can be used for fuel (e.g., corn)
- compare two very different natural resources (e.g., sand versus wind, wind can be used for energy; gold versus corn, corn can be used for fuel)

Prerequisite Skill: Students identify that certain things need energy or fuel to work.

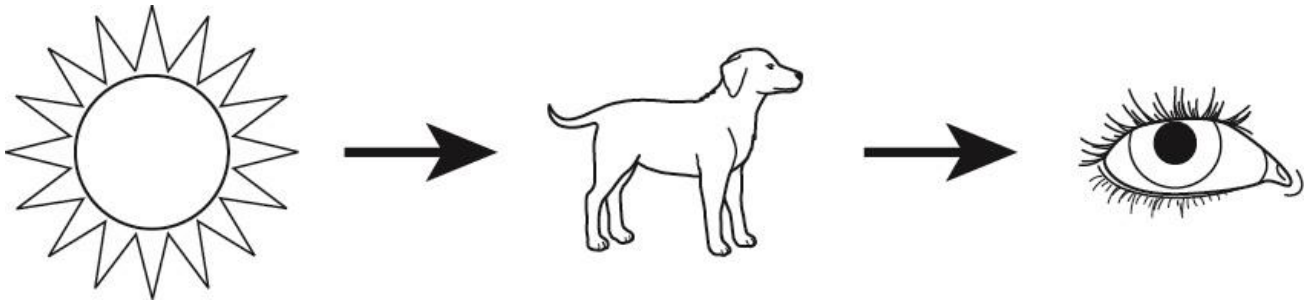
- compare the difference between a car that has fuel in it and the same car that does not have fuel in it to identify that a car needs fuel to work (can also compare electric cars to identify that those cars need electricity to work)
- identify a way to make an object that requires electricity work (e.g., a lamp needs to be plugged in)

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| Key Terms | coal, community, crops, electricity, energy, environment, fuel, gasoline, gold, natural gas, natural resource, oil, pollution, soil, solar, wind, wood |
| Additional Resources or Links | <p>This is a video that shows the ways electricity affects the environment. https://tpt.pbslearningmedia.org/resource/ee18-sci-airpol/kids-go-green-reducing-air-pollution/</p> <p>This is a video about a source of energy that has only been recently used—hydropower. https://tpt.pbslearningmedia.org/resource/f88193d0-f6ac-4ce8-b20e-41fd09b455ca/hydropower-explore-more-the-future-of-energy/</p> <p>This is a video that shows how to use solar power in your house. https://tpt.pbslearningmedia.org/resource/wnet08.sci.phys.energy.wnetsolar/solar-house/</p> <p>This is an article about how to teach energy and electricity, as well as the environmental impacts, to elementary students. https://ngss.nsta.org/Resource.aspx?ResourceID=432</p> |
| Cross-Content Standards | <p>Language Arts: Use Descriptive Language (4.W.3.b), Identify Facts (4.W.4.b), and Identify Appropriate Print and Digital Sources (4.W.6.b)</p> <p>Mathematics: Interpret Information in a Line Plot (4.4.1.a) and Solve a Problem with Addition or Subtraction Using a Line Plot (4.4.2.a)</p> |

Science—Grade 4 Life Sciences

| SC.4.6 Structure, Function, and Information Processing | | Access Points | | |
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| Standard/Indicator | Extension | A | B | C |
| <p>SC.4.6.3.A Develop a model to describe that light reflecting from objects and entering the eyes allows objects to be seen. Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.</p> | <p>Use or develop a simple model to explain that light reflected from an object enters the eye, allowing the object to be seen.</p> | <p>Use a simple model to describe that light reflected from an object enters the eye, allowing the object to be seen.</p> | <p>Given an incomplete model showing that light reflected from an object enters the eye, allowing the object to be seen, identify the missing step or part of the model.</p> | <p>Given a model showing light reflected from an object to an eye, identify what object is seen.</p> |
| <p>Standard Clarification</p> <p>Students will create or use a simple model to show that light reflects off an object and enters the eye, which allows the object to be seen. The focus for this standard and extension is the process of seeing objects (light reflects from an object and enters the eye), and does not refer to the parts of an eye or how an eye works.</p> | | | | |
| <p>Target Activities for Access Point A</p> <p>A. Students use or develop a model to describe that light reflected from an object enters the eye, allowing the object to be seen.</p> <ul style="list-style-type: none"> ● create a simple model of a person looking at something using images (e.g., light source, arrows, dog, human eye), and point to the steps in the model to describe how the eye is able to see the object ● point to a light source in a darkened classroom, then to a book or other familiar object, and then to an image of an eye, and describe how the light reflects off the book to the eye, which allows a person to see the book ● use a model of light reflected from a tree to a human eye in order to explain how the tree can be seen ● use a light source in a darkened classroom (e.g., flashlight, lamp, classroom lights), turning it on and off, and explain that an object can be seen when the light is shining on the object because the light is reflected and enters the eye | | | | |
| <p>Scaffolding Activities for Access Points B and C</p> <p>B. Students identify the missing step or part of a model that shows light reflecting off an object and entering an eye, allowing the object to be seen.</p> <ul style="list-style-type: none"> ● watch a video about how objects are seen, and complete a worksheet with the steps mentioned in the video ● choose the image that best completes a model showing that light reflects off an object and enters the eye, allowing the object to be seen (e.g., choose the image of light reflecting off the object when given a model of an object and the eye) <p>C. Students identify the object that is seen, using a model of light reflecting off an object and entering the eye.</p> <ul style="list-style-type: none"> ● choose the key from two choices (e.g., key and lamp) when shown a model of light shining on and reflecting off a key ● choose a mouse when shown a model of a hunting owl, the moon, and a mouse and asked to identify what the owl sees <p>Prerequisite Skill: Students discriminate between objects that give off light and objects that don't give off light.</p> <ul style="list-style-type: none"> ● sort pictures into two groups: produces light (e.g., fire, flashlight) and doesn't produce light (e.g., rock, banana) <p>Prerequisite Skill: Students recognize objects that reflect.</p> <ul style="list-style-type: none"> ● look at various objects that reflect (e.g., mirror) and don't reflect (e.g., piece of black paper) and recognize which objects reflect images | | | | |

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| Key Terms | eye, light, object, reflect, see(n) |
| Additional Resources or Links | This is a video about light and how humans see objects. https://www.generationgenius.com/videolessons/introduction-to-light-video-for-kids/ This is a video about light reflection and sight. https://www.youtube.com/watch?v=0HhXAbwzcQo |
| Cross-Content Standards | Language Arts: Use Text Features (4.RI.4), Answer Questions (4.RI.6), Use Context Clues (4.V.1.a), and Identify Facts (4.W.4.b) Mathematics: Compare Angles (4.3.1.b) and Identify Parallel and Intersecting Lines (4.3.1.c) |



Science—Grade 4 Life Sciences

| SC.4.6 Structure, Function, and Information Processing | | Access Points | | |
|--|--|---|--|--|
| Standard/Indicator | Extension | A | B | C |
| <p>SC.4.6.3.B Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. Assessment is limited to macroscopic structures within plant and animal systems.</p> | <p>Use evidence from observations, scenarios, or data to explain that plants and animals have internal and external body structures that function to support survival, growth, behavior, and reproduction.</p> | <p>Given evidence from observations or scenarios, explain that plants and animals have internal (e.g., organs, bones, muscles, fluids, wood) and external (e.g., skin, limbs, leaves, flowers) body structures that function to support survival, growth, behavior, and reproduction.</p> | <p>Given an internal or external body structure of a plant or animal, identify its function.</p> | <p>Given the function of an external plant or animal body structure, identify the structure.</p> |
| Standard Clarification | | | | |
| <p>Students will use evidence from observations, scenarios, or data of the external and internal structures of plants and animals to determine how those structures help the plant or animal survive, behave, grow, or reproduce.</p> | | | | |
| Target Activities for Access Point A | | | | |
| <p>A. Students use evidence from observations or scenarios to explain that plants and animals have internal and external body structures that function to support survival, growth, behavior, and reproduction.</p> <ul style="list-style-type: none"> ● observe the external structures of various animals (e.g., animals with fur, animals with long necks, animals with webbed feet), and pair them with pictures of different environments to explain how certain external structures help the animals survive (e.g., animals with thick fur stay warm in cold environments) ● observe the external structures of various plants (e.g., plants with spikes, plants with long roots), and pair them with pictures of different environments to explain how certain external structures help the plants survive (e.g., plants with long roots grow well in dry environments because they can collect water that is deep in the ground) ● create a book showing the internal structure of a plant or an animal, and discuss how certain parts of the internal structure support the survival, growth, behavior, and reproduction of the plant or animal (e.g., fat stores in bears support hibernation in winter) ● research a specific plant or animal, and create a report on the external and internal structures that help the plant or animal survive, grow, and/or reproduce and/or how the structures help with certain behaviors | | | | |
| Scaffolding Activities for Access Points B and C | | | | |
| <p>B. Students identify or describe the function of an internal or external body structure of an animal or plant.</p> <ul style="list-style-type: none"> ● complete sentence stems or sentence starters to describe the functions of internal or external body structures of an animal (e.g., A tiger uses its sharp claws to _____.) ● complete sentence stems or sentence starters to describe the functions of internal or external body structures of a plant (e.g., A plant has long roots to _____.) ● watch a video about the structure of a plant, and discuss the purpose or function of the roots of the plant ● read or listen to a story about hummingbirds, and identify the function of the hummingbird's long, thin bill <p>C. Students identify the external structure of a plant or animal.</p> | | | | |

- choose the picture of bark when given a picture of bark and a leaf and asked which external structure protects a tree
- point to or name specific body parts when given the function of the body part (e.g., point to skin when asked what protects the body, wiggle fingers or toes when asked to identify what is used to grasp and hold things)

Prerequisite Skill: Students discriminate between external and internal structures.

- sort pictures of external or internal structures of animals and plants
- identify parts of specific external or internal structures of a plant or an animal

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| Key Terms | animal, behavior, body structure, external, function, growth, internal, plant, reproduction, structure, survival |
| Additional Resources or Links | <p>This is a video about the muscular and skeletal systems and their functions. https://www.youtube.com/watch?v=ynVRDsDC-84</p> <p>This is a video about plant structures. https://tpt.pbslearningmedia.org/resource/5dea21b4-6c92-46ff-982c-8650f9429c01/think-garden-plant-structure/</p> |
| Cross-Content Standards | <p>Language Arts: Identify How Individuals Are Related (4.RI.2), Answer Literal Questions (4.RI.6), Use Descriptive Language (4.W.3.b), and Identify Supporting Facts (4.W.4.b)</p> <p>Mathematics: Solve Real-World Addition/Subtraction Problems (4.2.3.a)</p> |

Science—Grade 4 Life Sciences

| SC.4.6 Structure, Function, and Information Processing | | Access Points | | |
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| Standard/Indicator | Extension | A | B | C |
| <p>SC.4.6.3.C Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information. Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.</p> | <p>Use simple models to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.</p> | <p>Use a simple model to identify that an animal receives different types of information (e.g., sound, scent, flavor, color, temperature, pain) through their senses (e.g., hear, smell, taste, see, touch), processes the information in their brain, and then responds to the information.</p> | <p>Given an incomplete model, identify how an animal receives information, processes it, and responds by sequencing the parts of the model or by identifying the missing part of the model.</p> | <p>Given a scenario in which an animal receives information, identify which sense was used to receive the information.</p> |
| Standard Clarification | | | | |
| Students will observe and interpret models showing animals receiving information through their senses and responding to that information. | | | | |
| Target Activities for Access Point A | | | | |
| <p>A. Students describe what is happening in a model of an animal receiving information and responding to that information.</p> <ul style="list-style-type: none"> ● observe a video of a bat hearing sound waves bounce off a pond, and discuss how the bat knows how to get a drink ● watch videos of eagles, owls, and other birds catching fish in the water, and discuss how the animals know where the fish are (i.e., they use sense of sight to detect movement) ● observe a simple model of a bat and another animal (e.g., deer), and explain how the bat senses the warmth of the animal through its sense of smell ● explain the senses used when a dog gets too close to a porcupine as seen in a model ● explain how a mouse uses its sense of smell and touch to choose food that is okay to eat ● use a model of a bee and flowers to describe how a bee uses its sense of smell and sight to gather pollen (e.g., it will use smell to detect nectar and pollen and sense of sight to see color and choose bright flowers) ● use a model of a spiderweb and an insect caught in the spiderweb to explain how a spider uses its sense of touch to detect movement in the web and where the insect is in the web | | | | |
| Scaffolding Activities for Access Points B and C | | | | |
| <p>B. Students sequence models to demonstrate understanding of how animals receive information, process the information, and act on the information received.</p> <ul style="list-style-type: none"> ● sequence steps of the response of a dog encountering a skunk for a third time ● sequence steps of a fish using its sense of smell, sight, sound, and touch (water vibrations) to avoid a predator <p>B. Students identify the missing part of a model of an animal receiving information, processing the information, and acting on the information received.</p> <ul style="list-style-type: none"> ● identify the missing part of a model of a turtle feeling the warmth of the sun ● identify the missing part of a model of a bird seeing a tree and landing on the tree | | | | |

C. Students identify the specific sense an animal uses to receive information in given scenarios.

- activate the students' prior knowledge of senses by playing a game in which students identify objects using one of the five senses (this activity may be modified based on the individual student's needs and abilities)
- research and make a visual display of animals that are known for their excellent sense of hearing (e.g., bats, cats, dogs, dolphins, moths, owls)
- research and make a display to highlight fun or unusual facts about animal senses
 - Cats can rotate their ears 180 degrees to help them hear better.
 - Cats can walk on very narrow ledges and leap in the air.
 - Dogs can hear high-pitched sounds that humans can't hear.
 - Dogs and cats use their whiskers to help them locate objects.
 - In most owls, the left ear is slightly lower than the right ear to help it locate the direction sound is coming from as it turns its head.
- visually present scenarios in which animals are responding to a stimulus in their environment, and identify the sense(s) an animal will use to respond
 - There is something under a pile of leaves. It is making a rustling noise. An owl nearby catches a mouse under the pile of leaves. What sense(s) did the owl use to know the mouse was under the leaves?
 - A frog caught a bug. It put the bug in its mouth. The frog didn't like the bug. What sense(s) did the frog use to find out it didn't like the bug?
 - A cat is in a dark room and is able to find a small cat toy in the corner. The cat walked around and used his whiskers to help it find the toy. What sense(s) did the cat use?

Prerequisite Skill: Students recognize the five senses.

- indicate what eyes, ears, nose, fingers, and tongue do
- match a specific body part with a specific sense

Prerequisite Skill: Students recognize that using the five senses can provide information about the environment around them.

- use a sense other than sight to identify what an object is
- practice describing objects or using sounds to help others identify what an object is

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| Key Terms | brain, process information, pitch, respond, senses (hear, smell, taste, see, touch), sequence, understand, vibration |
| Additional Resources or Links | <p>This is a lesson that has students study crayfish and examine and experiment with crayfish senses. https://betterlesson.com/lesson/639574/crayfish-structures-for-sensing</p> <p>This is a video going through all the senses and which animals have each sense. https://www.youtube.com/watch?v=ThqxliM6zpc</p> <p>This is a video showing how snakes use heat sensors to sense danger. https://nebraskapublicmedia.pbslearningmedia.org/resource/7bc498bb-9803-4fe1-8fb9-2edaba39b61b/7bc498bb-9803-4fe1-8fb9-2edaba39b61b/</p> <p>This is a lesson plan that uses hands-on activities for students to help them learn more about the five human senses. https://nebraskapublicmedia.pbslearningmedia.org/resource/7eedf998-c927-4eff-906d-64a75203b6ea/discovering-senses-lesson-plan/</p> |
| Cross-Content Standards | <p>Language Arts: Identify How Events are Related (4.RI.2), Identify Similar Ideas (4.RI.5), and Identify Facts (4.W.4.b)</p> <p>Mathematics: Interpret Line Plot Data (4.4.1.a) and Solve Addition or Subtraction Using Line Plot Data (4.4.2.a)</p> |

Science—Grade 4

Earth and Space Sciences

| SC.4.13 Earth's Systems: Processes That Shape the Earth | | Access Points | | |
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| Standard/Indicator | Extension | A | B | C |
| SC.4.13.4.A Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time. | Observe or use pictures, videos, and information about patterns in rock formations and types of fossils in rock layers as evidence to explain that Earth's landscape changes over time. | Given pictures, videos, or information about patterns in rock formations (e.g., changing shapes of cliffs, arches, hoodoos, different colors and types of rock) or types of fossils in rock layers, describe changes to Earth's landscape. | Identify vast changes in the landscape (e.g., flat plains become deep canyons, mountains become hills, land is covered by ocean). | Recognize landscape formations (e.g., hill, mountain, valley, canyon, cliff, arch). |

Standard Clarification

Students will use evidence, such as fossils and rock layers, to understand that Earth changes over time. Students will recognize different landscapes and describe changes to the landscapes over time.

Target Activities for Access Point A

- A.** Students describe how rock formations and fossils in rock layers show that Earth's landscape has changed over time.
- observe and discuss images and complete various activities in the *Junior Paleontologist Activity Book* from the National Park Service (or similar book)
 - watch and discuss video of Badlands National Park showing rock formations and fossils present in the rocks
 - observe images of rock formations at Toadstool Geologic Park in Nebraska, and discuss the rock formations, rock layers, fossils found, and evidence of changes over time
 - watch and discuss NET video of Toadstool Geologic Park in Nebraska, and discuss sandstone formations, other rock formations, erosion, and fossil evidence to explain Earth changes over time
 - watch a video about the Grand Canyon that shows different layers in the canyon and the story behind each layer, and use this video as evidence to explain Earth changes over time

Scaffolding Activities for Access Points B and C

- B.** Students use rock formation or rock layer images to help identify changes that happened in the landscape over time.
- compare pictures of a specific landscape from a long time ago and now, and discuss differences between the two pictures
 - observe images of fossils in a rock wall formation, and discuss what the landscape was like when the plants and animals of those fossils were alive
 - observe images of various places in Nebraska from a long time ago, and discuss any differences or similarities between then and now
 - observe fossils found in Nebraska, and discuss what the animals and plants of those fossils needed when they were alive to identify whether the landscape has changed or stayed the same (e.g., evidence of marine fossils in current areas of dry land)
- C.** Students identify landscape formations in Nebraska and around the world.
- identify local landscapes (e.g., hills, rivers) found in specific cities in Nebraska or the state of Nebraska, using pictures or maps of the state
 - assist in creating a map of Nebraska with at least one landscape formation indicated on the map

- recognize common landscape formations (e.g., canyons, mountains) found around the world after watching a video on landscape formations
- identify natural landscape formations when given two pictures (e.g., a picture of a highway and a picture of a hill)

Prerequisite Skill: Students understand that people and things change over time.

- observe pictures of a person at two different ages, and identify one change between the pictures
- look at pictures of a landscape before a house was built on it and after a house was built on it, and identify one change between the pictures
- watch a time-lapse video of a tree growing from seed to maturity, and describe one thing that occurs in the video (e.g., the trunk grows wider)

Prerequisite Skill: Students recognize important information on a map.

- use a map to recognize ways to move about the school
- assist in creating a map of the school or city with at least one important place identified (e.g., student's main classroom, student's house)

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|-------------------------------|---|
| Key Terms | change, Earth, fossil, landform, landscape, map, rock formation, rock layer, past, pattern, present |
| Additional Resources or Links | <p>This the <i>Junior Paleontologist Activity Book</i> from the National Park Service. https://www.nps.gov/subjects/fossils/upload/Junior_Paleontologist_Reprint_2015_Spreads.pdf</p> <p>This is a picture showing rock formations at Toadstool Geologic Park in Nebraska. https://en.wikipedia.org/wiki/Toadstool_Geologic_Park#/media/File:Toadstool_Geologic_Park.jpg</p> <p>This is a website with pictures of rock formations, layers, and fossils at Toadstool Geologic Park in Nebraska. https://www.atlasobscura.com/places/toadstool-geological-park</p> <p>This is a video of Toadstool Geologic Park in Nebraska that shows rock formations, layers, rock material, and fossil evidence. https://www.youtube.com/watch?v=FPtZK8JrVww</p> <p>This is a video showing and describing Earth's layers. https://nebraskapublicmedia.pbslearningmedia.org/resource/nvmn-sci-grandcanyon/wgbh-nova-making-north-america-uncovering-layers-of-the-grand-canyon/</p> <p>This is a video about Earth's landscapes. https://www.generationgenius.com/videolessons/earths-landscapes-video-for-kids/</p> |
| Cross-Content Standards | <p>Language Arts: Central Idea and Key Details (4.RI.1), Identify Individuals and Events (4.RI.2), Answer Literal Questions (4.RI.6), and Identify Facts (4.W.4.b)</p> <p>Mathematics: Identify Inches (4.3.3.c)</p> |

Science—Grade 4

Earth and Space Sciences

| SC.4.13 Earth's Systems: Processes That Shape the Earth | | Access Points | | |
|---|--|---|--|--|
| Standard/Indicator | Extension | A | B | C |
| <p>SC.4.13.4.B Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. Assessment is limited to a single form of weathering or erosion.</p> | <p>Use observations, data, and/or measurements as evidence to describe the weathering and erosion of a rock formation by water, wind, or plants.</p> | <p>Given observations, data, or measurements as evidence, describe the weathering (breakdown) and erosion (removal) of a rock formation by water (e.g., waves, rivers, rain, ice), wind, or plants.</p> | <p>Given a set of pictures showing the weathering and erosion of a rock formation, sequence the pictures or identify the missing step in a sequence.</p> | <p>Given a picture of an eroding rock formation and a picture of a vastly different natural process (e.g., forest fire, sprouting seed, deposition), identify erosion.</p> |
| Standard Clarification | | | | |
| Students will provide evidence of weathering and erosion of a rock by different natural processes (i.e., water, wind, or plants). | | | | |
| Target Activities for Access Point A | | | | |
| <p>A. Students describe weathering and erosion of a rock or a rock formation using evidence.</p> <ul style="list-style-type: none"> ● watch a time-lapse video of weathering (breakdown) on a piece of limestone rock by water to see how water changes the shape of a rock and what happens to the rest of the rock ● measure changes in a piece of sedimentary rock that is placed under running water, and discuss what happens to the missing pieces of the rock ● look at a photograph of a tree root growing through a rock, and discuss observations that provide evidence of weathering and erosion ● watch a video about ice wedging on a mountain and the scree (broken rock fragments at the base of a cliff) from the weathered rock, and discuss evidence that ice causes weathering and erosion ● watch a video showing weathering caused by different types of erosion ● look at a photograph of a rock formation to identify evidence of wind and water erosion | | | | |
| Scaffolding Activities for Access Points B and C | | | | |
| <p>B. Students identify different stages of erosion to demonstrate understanding of weathering and erosion.</p> <ul style="list-style-type: none"> ● sequence a series of three images of a rock to model wind erosion over time ● sequence a series of pictures showing wind erosion over time, beginning with a sculpture rock and ending with a collection of boulders <p>C. Students discriminate between eroding rocks and other natural processes.</p> <ul style="list-style-type: none"> ● After looking at a variety of images of natural processes, recognize that erosion is a gradual wearing away of a surface ● use tools or observe tools being used (e.g., sandpaper, water, teacher using a knife) to change the shape of pieces of chalk to show how the formation can change shape with different tools and processes ● create visual displays of different examples of eroding rock formations after watching videos or listening to text about erosion ● sort pictures to discriminate between rocks being eroded and other natural process (e.g., forest fire, sprouting seed, deposition) | | | | |
| <p>Prerequisite Skill: Students identify differences in similar things.</p> <ul style="list-style-type: none"> ● complete an activity that requires finding differences in two pictures of the same scene ● compare and contrast familiar items | | | | |

Prerequisite Skill: Students recognize that water can make changes to items.

- participate in an investigation of pouring water over different items (e.g., sandcastles, pebbles, paper) to recognize that the water changes the item

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| Key Terms | erosion, evidence, ice, landform, natural process, plants, rock, rock formation, sequence, water, weathering, wind |
| Additional Resources or Links | <p>This is a video showing a mountain that is experiencing ice wedging and erosion. https://www.youtube.com/watch?v=XnCTcjNpuc</p> <p>This is a video showing weathering by different types of erosion with explanations of what is happening. https://www.youtube.com/watch?v=-43_HBy9huc</p> <p>This is a lesson plan with a video about the effects of weathering on landforms. https://ngss.nsta.org/Resource.aspx?ResourceID=44</p> <p>This is a lesson plan that uses a time-lapse video of coastal erosion in Alaska. https://ngss.nsta.org/Resource.aspx?ResourceID=175</p> |
| Cross-Content Standards | <p>Language Arts: Central Idea and Key Details (4.RI.1), Identify Individuals and Events (4.RI.2), Answer Literal Questions (4.RI.6), and Identify Facts (4.W.4.b)</p> <p>Mathematics: Identify Representations of Numbers (4.1.1.a) and Identify Inches (4.3.3.c)</p> |

Science—Grade 4

Earth and Space Sciences

| SC.4.13 Earth's Systems: Processes That Shape the Earth | | Access Points | | |
|--|---|---|--|---|
| Standard/Indicator | Extension | A | B | C |
| SC.4.13.4.C Analyze and interpret data from maps to describe patterns of Earth's features. | Gather and use information from maps and other media to describe or compare Earth features. | Use information (e.g., symbols, land use, relative size, location) from maps and other media to describe or compare Earth features. | Given a map or other media showing different land features, identify a specific land feature (e.g., mountain, river, ocean, lake, canyon). | Given a map with a key, identify a specific land feature. |
| Standard Clarification | | | | |
| Students will look at maps, models, and diagrams showing different Earth features (e.g., canyons, lakes, mountains, oceans, rivers, valleys), and describe and compare the features. | | | | |
| Target Activities for Access Point A | | | | |
| <p>A. Students observe Earth features and describe or compare the features using maps and other media.</p> <ul style="list-style-type: none"> ● compare mountain ranges in the United States (e.g., location, size) using a map ● use maps to compare the lakes and rivers (e.g., lengths/sizes, numbers) in Nebraska and another state ● describe and compare different types of forests in the world using maps or pictures ● watch a video on oceans, and create a graphic organizer (e.g., Venn diagram) comparing Earth's oceans | | | | |
| Scaffolding Activities for Access Points B and C | | | | |
| <p>B. Students observe a map or other media and identify land features.</p> <ul style="list-style-type: none"> ● identify mountains, forests, or grasslands on a physical map ● identify an ocean on a map when given two choices of bodies of water (e.g., ocean and river) ● participate in creating a world map for the class using a template by coloring all the bodies of water one color (e.g., blue), all the forests another color (e.g., green), and all the mountains a third color (e.g., brown) <p>C. Students use a map key to identify a land feature.</p> <ul style="list-style-type: none"> ● use a school map with a key to indicate important or favorite areas in the building ● assist in creating a map with a key of a familiar street or town ● locate a familiar local land feature (e.g., river, lake) using a key on a Nebraska state map <p>Prerequisite Skill: Students identify a map.</p> <ul style="list-style-type: none"> ● indicate a map when shown a map and a book ● sort pictures into map and not map categories <p>Prerequisite Skill: Students recognize common land features.</p> <ul style="list-style-type: none"> ● discriminate between common land features (e.g., lake, mountain, river) when given two pictures ● describe or identify important spaces or land features around the school or another familiar area <p>Prerequisite Skill: Students recognize a difference in the size and/or length of key land features.</p> <ul style="list-style-type: none"> ● recognize which land feature is taller or longer when given information on two different land features | | | | |

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| Key Terms | compare, Earth, Earth features, key, land features, map, media |
| Additional Resources or Link | <p>This is a map showing the different kinds of forests located in the world and the percentage of each type of forest. https://commons.wikimedia.org/wiki/File:Proportion_and_distribution_of_global_forest_area_by_climatic_domain,_2020.svg</p> <p>These are maps of the United States that show lakes, rivers, and oceans. https://picryl.com/media/unites-states-map-rivers-and-lakes-3ab9b6 https://commons.wikimedia.org/wiki/File:Mississippiriver-new-01.png</p> <p>This is a lesson plan that allows students to use data from world maps to identify landscapes. https://ngss.nsta.org/Resource.aspx?ResourceID=682</p> |
| Cross-Content Standards | <p>Language Arts: Use Text Features (4.RI.4), Use Context Clues (4.V.1.a), and Use Descriptive Language (4.W.3.b)</p> <p>Mathematics: Use $<$, $>$, and $=$ To Compare (4.1.1.f), Geometry Characteristics (4.3.1) and Geometry Measurement (4.3.3), and Interpret Information Using Data Points (4.4.1.a)</p> |

Science—Grade 4

Earth and Space Sciences

| SC.4.13 Earth's Systems: Processes That Shape the Earth | | Access Points | | |
|--|--|--|---|---|
| Standard/Indicator | Extension | A | B | C |
| <p>SC.4.13.4.D Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.</p> | <p>Observe and gather information about the impacts of natural Earth events that affect humans and generate or compare possible solutions.</p> | <p>Given observations or information about the impacts of natural Earth events that affect humans (e.g., earthquakes, floods, tsunamis, volcanic eruptions), generate or compare possible solutions.</p> | <p>Given the impacts of a natural Earth event and two vastly different solutions, identify which solution will better reduce the impacts to humans.</p> | <p>Recognize a solution to a natural Earth event that will reduce the impact on humans.</p> |
| Standard Clarification | | | | |
| <p>Students will use information about natural events to determine a solution to minimize the impacts on humans and/or compare different solutions that minimize impacts on humans.</p> | | | | |
| Target Activities for Access Point A | | | | |
| <p>A. Students generate solutions to minimize the impacts of a natural Earth event on humans.</p> <ul style="list-style-type: none"> ● discuss a river flooding from heavy rains and what can be done to stop the river from overflowing into a town ● watch a video or listen to a book about earthquakes, and discuss what people can do to prevent things in their house from breaking, tipping over, or falling off shelves and walls (e.g., securing bookshelves to the wall so they don't tip over) ● watch a video on tsunamis and generate a solution for a person who wants to build a house on an island ● use information about various natural Earth events (e.g., earthquakes, floods, tsunamis) to design and create structures that can withstand or minimize the event's impact on humans <p>A. Students compare solutions that minimize the impacts of a natural Earth event on humans.</p> <ul style="list-style-type: none"> ● create structures using different materials (e.g., craft sticks, building blocks, straws), and compare the durability of each structure by simulating a natural Earth event (e.g., pour water over the structure to simulate heavy rains and flooding) ● use task cards or sentence strips to compare solutions that minimize the human impacts of a natural Earth event that occurs in Nebraska (e.g., thunderstorms, tornadoes, hail): Tornadoes can knock down trees that destroy houses. One way to protect a house from a tornado is _____. Another way to protect a house from a tornado is _____. | | | | |
| Scaffolding Activities for Access Points B and C | | | | |
| <p>B. Students select the better of two solutions to minimize impacts of a natural Earth event on humans.</p> <ul style="list-style-type: none"> ● choose the solution that better minimizes the impact of flooding during an investigation (e.g., pour water over a pile of sand and then over a second pile of sand that is surrounded by rocks and determine that the better solution is to surround the sand with rocks) ● watch a video about a natural Earth event that occurs in Nebraska (e.g., thunderstorm, tornado, hail), and then create a list of ideas that may help minimize the event's impact on humans ● match a solution to the natural Earth event that it would most benefit (e.g., create runoff ditches in areas that are prone to flooding) | | | | |

C. Students recognize solutions to relevant and local Earth events.

- practice a tornado drill, and then discuss how the procedures reduce chances of people getting hurt during a tornado
- watch videos of people preparing for a flood
- choose clothes and items that would be useful to have and/or use during a natural Earth event (e.g., raincoat, rainboots, and an umbrella during a rainstorm)

Prerequisite Skill: Students recognize natural Earth events.

- listen to a story about natural Earth events, and then identify one event when given two choices
- give a simple weather report during a morning meeting or at another appropriate time during the school day

Prerequisite Skill: Students differentiate between a problem and a solution.

- play a game in which students draw from a deck of cards that have relevant, common problems and recognize a solution to the problem

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|-------------------------------|---|
| Key Terms | affect, compare, Earth, event, generate, impact, natural, problem, solution, weather |
| Additional Resources or Links | <p>This is a video that gives information about tsunamis and what to do. https://oceanoday.noaa.gov/tsunamiawareness/</p> <p>This is a lesson plan about severe weather (blizzards). https://ngss.nsta.org/Resource.aspx?ResourceID=815</p> <p>This is a lesson plan about using correct materials to solve problems and how to compare the materials. https://ngss.nsta.org/Resource.aspx?ResourceID=26</p> <p>This is an investigation that shows what happens when an earthquake occurs. https://ngss.nsta.org/Resource.aspx?ResourceID=77</p> |
| Cross-Content Standards | <p>Language Arts: Identify How Events Are Related (4.RI.2), Identify Similar Ideas (4.RI.5), and Identify Facts (4.W.4.b)</p> <p>Mathematics: Use $<$, $>$, and $=$ To Compare (4.1.1.f), Solve Real-World Addition/Subtraction Problems (4.2.3.a), and Interpret Information Using Data (4.4.1.a)</p> |