NEBRASKA

Alternate Science Instructional Supports for NSCAS Science Extended Indicators Grade 8

for
Students with the Most Significant Cognitive Disabilities
who take the
Statewide Science Alternate Assessment

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Overview

Introduction

Science standards apply to all students, regardless of age, gender, cultural or ethnic background, disabilities, aspirations, or interest and motivation in science (NRC, 1996).

The science standards, extended indicators, and instructional supports in this document were developed by Nebraska educators to facilitate and support science instruction for students with the most significant intellectual disabilities. They are directly aligned to the Nebraska's College and Career Ready Standards for Science adopted by the Nebraska State Board of Education.

The instructional supports included here are sample tasks that are available to be used by educators in classrooms to help instruct students with significant intellectual disabilities.

The Role of Extended Indicators

For students with the most significant intellectual disabilities, achieving grade-level standards is not the same as meeting grade-level expectations, because the instructional program for these students addresses extended indicators.

It is important for teachers of students with the most significant intellectual disabilities to recognize that extended indicators are not meant to be viewed as sufficient skills or understandings. Extended indicators must be viewed only as access or entry points to the grade-level standards. The extended indicators in this document are not intended as the end goal but as a starting place for moving students forward to conventional reading and writing. Lists following "e.g." in the extended indicators are provided only as possible examples.

Students with the Most Significant Intellectual Disabilities

In the United States, approximately 1% of school-aged children have an intellectual disability that is "characterized by significant impairments both in intellectual and adaptive functioning as expressed in conceptual, social, and practical adaptive domains" (U.S. Department of Education, 2002 and American Association of Intellectual and Developmental Disabilities, 2013). These students show evidence of cognitive functioning in the range of severe to profound and need extensive or pervasive support. Students need intensive instruction and/or supports to acquire, maintain, and generalize academic and life skills in order to actively participate in school, work, home, or community. In addition to significant intellectual disabilities, students may have accompanying communication, motor, sensory, or other impairments.

Alternate Assessment Determination Guidelines

The student taking a Statewide Alternate Assessment is characterized by significant impairments both in intellectual and adaptive functioning which is expressed in conceptual, social, and practical adaptive domains and that originates before age 18 (American Association of Intellectual and Developmental Disabilities, 2013). It is important to recognize the huge disparity of skills possessed by students taking an alternate assessment and to consider the uniqueness of each child.

Thus, the IEP team must consider all of the following guidelines when determining the appropriateness of a curriculum based on Extended Indicators and the use of the Statewide Alternate Assessment.

- The student requires extensive, pervasive, and frequent supports in order to acquire, maintain, and demonstrate performance of knowledge and skills.
- The student's cognitive functioning is significantly below age expectations and has an impact on the student's ability to function in multiple environments (school, home, and community).
- The student's demonstrated cognitive ability and adaptive functioning prevent completion of the general academic curriculum, even with appropriately designed and implemented modifications and accommodations.
- The student's curriculum and instruction is aligned to the Nebraska College and Career Ready Science Standards with Extended Indicators.
- The student may have accompanying communication, motor, sensory, or other impairments.

The Nebraska Department of Education's technical assistance documents "***IEP Team Decision Making Guidelines—Statewide Assessment for Students with Disabilities***" and "***Alternate Assessment Criteria/Checklist***" provide additional information on selecting appropriate statewide assessments for students with disabilities. School Age Statewide Assessment Tests for Students with Disabilities—Nebraska Department of Education.

Instructional Supports Overview

As stated, these science instructional supports are sample tasks available for use by educators who are instructing students with significant intellectual disabilities. The instructional supports are aligned to the extended indicators in grades five, eight, and eleven. Each instructional support includes the following components:

- Standard/extended indicator/access points
- Standard clarification
- Target activities for access point A
- Scaffolding activities for access points B and C
- Prerequisite skills (where applicable)
- Key terms
- Additional resources or links
- Cross-content standards
- Graphics (where applicable)

The standard clarification statement provides educators with additional science background knowledge related to the content of the extended indicator.

The target activities, scaffolding activities, and prerequisite skills are presented in a top down model with the most complex access or entry points (e.g., learning objective and activities for access point A) listed first and the least complex access or entry points (e.g., learning objective and activities for access point C or prerequisite skills) listed last.

The activities listed are suggestions for augmenting or enhancing current instruction and are intended to provide additional support for students to achieve the learning objective stated at each level (access point A, B, C, and prerequisite skills). The activities listed are not intended to be all-inclusive, nor is it intended to imply that all students would benefit from every activity. Educators can select and modify activities to support or enhance current instruction based on individual student needs and abilities.

Key terms may be selected and used by educators to guide vocabulary instruction as determined appropriate for each individual student. The list of key terms are suggestions and not intended to be an all-inclusive list.

Additional resources or links are optional images, video clips, and other additional activities to provide guidance or further support instruction.

The cross-content standards and life skills activities are suggestions to assist educators in planning multidisciplinary activities for integrated curricula.

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Science—Grade 8 Physical Sciences

SC.8.1 Forces and Interactions

SC.8.1.1.A

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. Assessment is limited to vertical or horizontal interactions in one dimension.	Participate in investigations to describe the cause-and-effect relationship between two colliding objects.	Participate in guided investigations to describe the relative motions (direction and speed) of two colliding objects.	Identify that the speed and/or direction of one object changes when two objects collide.	Recognize that an object changes direction or speed when a moving object and a stationary object collide.

Standard Clarification

Students will identify what happens when two objects collide. Students will describe the speed and direction of objects before and after they collide.

Target Activities for Access Point A

A. Students investigate what happens when two objects (toy cars, balls, marbles) are pushed toward each other and collide.

- compare the results of a collision when two moving objects are the same weight to when two moving objects are different weights
- compare the results of a collision when two objects are pushed with the same force to when one object is pushed with more force
- observe the results of a collision when one object is pushed on a flat surface and the other object is rolled down a ramp set at different heights

Scaffolding Activities for Access Points B and C

B. Students identify that the speed and/or direction of one object changes when two objects collide. Stationary objects should be small or light enough to move when hit by another object.

- observe what happens when a ball is rolled at bowling pins (or plastic cups) at different speeds
- observe what happens to the direction of a ball (basketball, tennis ball, whiffle ball, ping pong ball, pinball) when it hits a stationary object or another ball.

C. Students recognize that a moving object changes direction or speed after it collides with a stationary object that does not move after the collision.

- observe the angle that a rolling ball bounces back after it collides with a wall
- observe a ball rolling toward a wall at different speeds by using a ramp set at different heights
- observe whether different sized balls (basketball vs. tennis ball) create different results

Prerequisite Skill: Students differentiate between fast and slow, forward and backward, and left and right.

Key Terms

backward, collide, crash, fast, forward, left, pull, push, right, slow, speed

Additional Resources or Links

- This is a video clip showing the collision of bumper cars in slow motion.
  https://youtu.be/_1tEcnqzJGk

Cross-Content Standards

- Language Arts: Antonyms (8.1.5.d) and Cause/Effect (8.1.6.j)
- Mathematics: Angle Measurements (8.3.1.a)

SC.8.1.1.C

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time; does not include use of trigonometry.	Participate in investigations to explain that a change in the motion of a stationary object depends on the amount of force applied to the object and the mass of the object.	Participate in a guided investigation to explain that an object with a large mass requires more force to move than an object with a smaller mass.	Identify which object requires the least or most force to make it move when given objects of three different masses (small, medium, large).	Recognize there is a difference in force to move a small object versus a large object.

Standard Clarification

Students will identify that the larger the mass of an object, the more force required to move that object. Mass is a measure of the amount of matter in an object and does not change. Weight is a measure of the pull of gravity on an object. Weight changes depending on where an object is because the force of gravity is different on Earth, in space, and on other planets. Students are not required to understand the difference between weight and mass.

Target Activities for Access Point A

A. Students participate in investigations to determine how mass affects the amount of force needed to move an object.

- select three objects to push and identify which object required the most force to push
- select three objects to pull and identify which object required the most force to pull
- participate in or observe a tug of war with an uneven mass of people on each side

Scaffolding Activities for Access Points B and C

B. Students compare the force needed to move three objects with different masses.

- roll three objects of different sizes and identify which object required the least/most force to roll
- push three objects of different sizes across the floor and identify which object required the least/most force to push
- pull three objects of different sizes and identify which object required the least/most force to pull

C. Students compare the force needed to move a small object and a large object.

- push an empty scooter and a scooter with someone sitting on it
- roll a smaller, lighter ball and a larger, heavier ball
- push a smaller, lighter box and a larger, heavier box across the floor
- pull a smaller, lighter object and a larger, heavier object

Prerequisite Skill: Students differentiate between lighter and heavier, smaller and larger, and more effort (force) and less effort (force).

Key Terms

force, heavier, larger, lighter, masses, pull, push, smaller

Additional Resources or Links

- This is a video on the difference between mass and weight.
  https://anydifferencebetween.com/difference-between-mass-and-weight/
- This is a video on Newton's 2nd Law of Motion.
  https://www.nasa.gov/stemonstrations-newtons.html

Cross-Content Standards

- Language Arts: Organizational Patterns (8.1.6.j)

SC.8.1.1.D

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Ask questions about data to determine the factors that affect the strength of electrical and magnetic forces. Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.	Participate in investigations to describe factors that affect the attraction and/or repulsion of a magnetic or static electric force on an object across a distance.	Participate in a guided investigation to describe how the pull or push of a magnetic or static electric force can be affected by the strength of the magnet or charge, the type of charge (positive/ negative), or the distance between an object and the source of the attraction or repulsion.	Use a model to identify that changing the distance between the source of a magnetic or static electric force and an object affects the strength of the pull or push.	Recognize that magnets pull on magnetic objects.

Standard Clarification

Students will investigate different magnets and/or objects with a static electric charge to identify how the distance between magnetic or charged objects affects their attraction (pull) or repulsion (push) to each other.

Target Activities for Access Point A

A. Students participate in investigations with magnets and static electricity to determine how the distance between charged objects, the strength of charges, and the type of charge (positive or negative) affect attraction and repulsion.

- move two magnets toward each other and measure the relative distance between the two magnets when the magnetic force (push or pull) is felt
- change the alignment of the magnetic poles (same charge vs opposite charge) and measure the relative distance between two magnets when the magnetic force (push or pull) is felt
- use two magnets of different sizes to attract objects (a weak magnet holds fewer paper clips than a strong magnet)
- create static electricity by rubbing a balloon on hair or rubbing feet on the carpet and identify objects that will cause an electric shock

Scaffolding Activities for Access Points B and C

B. Students identify that distance affects the magnetic force.

- observe the strength of the pull or push when metal objects (a paper clip, a nail, a washer, a bolt) are moved closer to a magnet
- measure the relative distance at which an object begins to be moved (pushed or pulled) by a magnet
- observe examples of static electricity with the lights off in a room by rubbing a balloon on hair or rubbing feet on the carpet and then touching something metal

C. Students recognize that magnets pull on magnetic objects.

- test magnets on different objects (a whiteboard, a file cabinet, a desk, a door frame, a windowsill) to find out which objects the magnets are attracted to
- participate in a “working walk” to identify objects throughout the school that are magnetic (door frames, lockers, chairs, tables)
- hold a magnet near magnetic objects (a paper clip, a nail, a washer, a bolt) and nonmagnetic objects (paper, a plastic cup, a pencil) without making contact to observe which objects move toward the magnet

Prerequisite Skill: Students differentiate between a metal and a nonmetal object.

Key Terms

force, magnetic, poles, pull, push, static, static electricity

Additional Resources or Links

- This is a video on magnetic force and magnetic field.

  https://www.youtube.com/watch?v=R4ht2RcWVII

- This is an article listing magnet facts for kids.

  https://www.sciencekids.co.nz/sciencefacts/magnets.html

- This is a video on magnetic field.

  https://youtu.be/vgWiBYuPpjw

- This is a video on static electricity.

  https://youtu.be/yc2-363MIQs

Cross-Content Standards

- Language Arts: Antonyms (8.1.5.d) and Cause/Effect (8.1.6.j)
- Mathematics: Absolute Value (8.1.2.c)

SC.8.1.1.E

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. Assessment does not include Newton's Law of Gravitation or Kepler's Laws.	Use evidence to support the claim that each object on Earth is affected by the force of gravity and that the strength of the force is dependent on the object's mass.	Use evidence to explain that each object on Earth is pulled toward the ground by the force of gravity and that the strength of the pull is dependent on the object's mass.	Identify which of two objects with different masses experiences a stronger pull from gravity.	Recognize that dropped objects fall down/toward the ground.

Standard Clarification

Students will use evidence to show that every object on Earth is affected by the force of gravity. The strength of gravity depends on an object's mass. Mass is a measure of the amount of matter in an object. Objects with more matter have greater mass. The force of gravity increases with increasing mass. Weight is a measure of the pull of gravity on an object.

Target Activities for Access Point A

A. Students use or collect evidence that all objects fall toward the ground due to gravity.

- drop a variety of objects and observe that they all fall in the same direction—toward the ground

A. Students use or collect evidence that the mass of an object affects the strength of the pull of gravity. Note that some falling objects (a feather, paper) experience greater air resistance and appear to fall slower, but if they were dropped in the absence of air, they would fall at the same rate.

- drop two balls with different masses or roll them down a ramp and observe that the balls reach the ground at the same time
- drop two balls with different masses from the same height into a box of sand, clay, or kinetic sand and observe that the ball with the greater mass makes a deeper crater at impact
- weigh two objects with different masses and recognize that weight is a measure of the pull of gravity on the objects and that objects with greater mass will have greater weight

Scaffolding Activities for Access Points B and C

B. Students recognize that gravity pulls with greater force on objects with greater mass, but when objects with different masses are dropped, they will fall at the same rate.

- drop a variety of objects of different masses and observe that they hit the ground at the same time
- measure the time it takes for objects with different masses to hit the ground
- change the height from which objects with varied masses are dropped to see that they still fall at the same rate

C Students recognize that objects fall down toward the ground.

- drop a variety of objects of different masses
- participate in egg drop activity

Prerequisite Skill: Students understand that there is a difference between mass and weight; however, the terms are often used interchangeably when discussing objects on Earth.

Key Terms

crater, direction, downward, gravity, impact, mass, speed, strength, weight

Additional Resources or Links

- This is a video on gravity.

  https://www.youtube.com/watch?v=EwY6p-r_hyU&disable_polymer=true

- This page gives the directions for an egg drop experiment.

  https://www.phys.vt.edu/outreach/projects-and-demos/egg-drop.html

Cross-Content Standards

- Language Arts: Identify Evidence (8.2.2.b)
- Mathematics: Proportional Relationship (8.2.1.b) and Volume (8.3.3.d)

SC.8.2 Waves and Electromagnetic Radiation

SC.8.2.2.A

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. Assessment does not include electromagnetic waves and is limited to standard repeating waves.	Use models to investigate the relationship between the amplitude of waves and the amount of energy in waves.	Use models to describe the relationship between the amplitude of waves and the energy of waves.	When given the amplitude of two or more waves, identify the wave that is the largest or has the most energy.	Recognize a wave.

Standard Clarification

Students will use a model to determine the relationship between the amplitude of a wave and the amount of energy in a wave. The amplitude of a wave is determined by the amount of energy present. Amplitude is the height of a wave. A wave with less height has less energy than a wave with more height. A jump rope is a useful tool to demonstrate the focus of this standard. When less energy is used to move a rope, small waves are created, but when more energy is used to move a rope, large waves are created.

Target Activities for Access Point A

A. Students use models to understand that more energy is required to make waves with greater amplitude.

- use a slinky, a rope, or water to create waves and differentiate between quick, small waves and slow, big waves and the difference in the amount of energy required
- compare diagrams or pictures of waves to identify changes in amplitude
- compare diagrams or pictures of waves to identify changes in the amount of energy

Scaffolding Activities for Access Points B and C

B. Students compare two or more waves to understand that larger waves, having greater amplitude, have more energy than smaller waves.

- create waves with varying sizes by applying different amounts of energy (more/less force) to the material (a slinky, a rope, water)
- observe diagrams or pictures of two or more waves to identify the wave that is the largest
- observe diagrams or pictures of two or more waves to identify the wave that has the most energy

C. Students recognize waves using different materials, objects, diagrams, and pictures.

- create waves in water by dropping marbles of different sizes into a small wading pool, kicking the side of the pool, or hitting the top of the water
- create waves using a slinky, rope, or jump rope
- observe pictures and diagrams of waves (ocean waves or linear waves representing sound and light)

Prerequisite Skill: Students have a general understanding of the concept of energy.

Key Terms

amplitude, energy, wave

Additional Resources or Links

- This is a video on how to make a wave machine.

  https://youtu.be/VE520z_ugcU

- This is a video on energy.

  https://study.com/academy/lesson/what-is-energy-lesson-for-kids.html

Cross-Content Standards

- Language Arts: Explicit Evidence (8.1.6.i) and Compare/Contrast (8.1.6.j)
- Mathematics: Number Pattern (8.2.3.a)

SC.8.2.2.B

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. Assessment is limited to qualitative applications pertaining to light and mechanical waves.	Participate in investigations to identify when sound or light waves are reflected, absorbed, or transmitted through different materials.	Participate in a guided investigation to identify whether sound or light waves are reflected, absorbed, or transmitted through different materials.	When given an object or material, identify whether a sound or light wave is transmitted through or reflected by the object or material.	Recognize when light or sound passes through a material.

Standard Clarification

Students will investigate and observe sound and light waves to identify when they are reflected, absorbed, or transmitted through different materials. Waves that are transmitted pass through an object and keep traveling. Waves that are reflected bounce off an object and continue to travel in a different direction. Waves that are absorbed are stopped/blocked from transmitting because they are not able to pass through an object and do not bounce off and travel in a different direction.

Target Activities for Access Point A

A. Students investigate how sound and light waves interact with different objects and materials.

- experiment using sound (whistle) and light (flashlight) to discover which materials (a mirror, paper, a solid object) with different properties (solid, liquid, clear, opaque, soft, hard) transmit, reflect, and absorb sound and light
- identify the results of each investigation as one of the following: wave absorbed, wave reflected, or wave transmitted

Scaffolding Activities for Access Points B and C

B. Students differentiate between sound waves being transmitted and reflected.

- listen to sounds traveling through different objects and materials (a door, a window, a book, paper)
- listen for an echo (sound reflected) in the gymnasium

B. Students differentiate between light waves being transmitted and reflected.

- shine a light toward a door, a window, or a mirror

C. Students recognize when light or sound passes through different materials.

- hold a flashlight up to different objects (paper, mesh, solid objects) to observe whether light does or does not pass through
- recognize when sounds come from the other side of a door, window, wall, or sheet

Prerequisite Skill: Students understand that light and sound are waves of energy that cannot be seen.

Prerequisite Skill: Students differentiate between reflection (bouncing back), transmission (going through), and absorption (being stopped or blocked) when using objects that are visible.

- bounce a ball at a wall (reflection), throw a ball through a hoop (transmission), and throw a ball into a baseball glove (absorption)

Key Terms

absorb, light, reflect, sound, transmit, waves

Additional Resources or Links

- This is a video on how waves transfer energy.

  https://tpt.pbslearningmedia.org/subjects/science/physical-science/

Cross-Content Standards

- Language Arts: Context Clues (8.1.5.b) and Explicit Evidence (8.1.6.i)
- Mathematics: Reflection of a Shape (8.3.2.a)

SC.8.2.2.C

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.	Use evidence to support the claim that information can be sent from one place to another using digital or analog signals (waves).	Use evidence to explain that waves (analog or digital signals) can be used to send information across a distance.	Identify familiar forms of analog or digital communication used to send information across a distance.	Recognize a communication device.

Standard Clarification

Students will recognize that information can be sent from one place to another (across distances) by using devices that transmit analog and digital signals. Analog waves carry natural signals with varying amplitudes such as the human voice, animal sounds, and the sound and pictures recorded on audio and video tapes. Analog devices include landline telephones, microphones, speakers, mercury thermometers, vinyl records, VCRs, and photocopiers. Digital devices include CDs, DVDs, computers, and cell phones.

Target Activities for Access Point A

A. Students find evidence of communication across distances.

- recognize different forms of communication (intercom, speakers, computers, phones, human voices, animal sounds)
- identify different forms of communication and explain that these forms of communication let people share information across distances
- identify examples of long-distance communication with people in a different city, in a different state, or across the ocean

A. Students identify devices that can communicate analog or digital information across a distance.

- select the correct object (a cell phone, a flashlight, or a camera) that will communicate information across a distance

Scaffolding Activities for Access Points B and C

B. Students recognize devices used to communicate.

- sort objects to identify which objects can be used to communicate (phones, a notepad and pencil, computers, walkie-talkies, signal flags, signal lights, fog horns) from objects that are not used to communicate (a stapler, a ball, a shoe)

Key Terms

analog signal, communication, digital signal

Additional Resources or Links

- This is a lesson on the difference between analog and digital signals.

  https://www.garrard.k12.ky.us/userfiles/296/Classes/11967/userfiles/296/my%20files/avd%20stemscopedia.pdf?id=549913#:~:text=Digital%20Signals&text=A%20one%20in%20binary%20turns,analog%20signals%20send%20continuous%20streams.

Cross-Content Standards

- Language Arts: Compare/Contrast (8.1.6.j) and Identify Evidence (8.2.2.b)
- History: Compare communication devices used today to communication devices from the past.

SC.8.4 Energy

SC.8.4.3.A

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.	Use data to describe the relationships between kinetic (motion) energy and the mass and speed of an object.	Use data to describe that the speed and mass of a moving object affect the kinetic energy (motion) of the object.	Use data to identify that an object traveling at a greater speed will have more kinetic energy than an object with the same mass traveling at a slower speed. Use data to identify that an object with a greater mass will have more kinetic energy than an object with less mass that is traveling at the same speed.	Recognize that an object with greater mass or greater speed has more kinetic energy.

Standard Clarification

Students will understand the relationship between kinetic (motion) energy and the mass and speed of an object. Kinetic energy describes objects that are moving (doing work). A moving object with a large mass has more kinetic energy than a moving object with less mass traveling at the same speed. This can be observed through collisions because an object with greater kinetic energy will move a stationary object farther (do more work) than an object with less kinetic energy. Similarly, when two moving objects have the same mass but are traveling at different speeds, the faster-moving object has more kinetic energy. For the focus of this standard, avoid setting up investigations that focus on changing the height of a moving object, as that deals with the potential to do work, known as potential (stored) energy.

Target Activities for Access Point A

A. Students use or collect data to observe the pattern that the kinetic energy of moving objects increases with increasing mass or speed.

- roll a ball toward bowling pins (or objects representing bowling pins) and recognize that when a ball with more mass hits the pins or when the ball is rolled faster, the pins scatter farther
- increase the mass of moving objects (pendulums, toy cars, carts) to observe an increase in the kinetic energy (speed) of the object when it moves (swings, rolls, or strikes another object)

Scaffolding Activities for Access Points B and C

B. Students use or collect data to compare the kinetic energy of moving objects using mass and speed.

- observe two cars with different masses as they travel down the same track (keep the height of track the same for both cars) and record which car passes a fixed distance sooner or which car travels farther in a fixed amount of time
- swing a washer tied to a string gently from side to side to create a pendulum and recognize where along the path the washer has the most kinetic energy (the pendulum slows as it moves upward and gains speed as it moves downward, with the greatest speed at the bottom of the curve); add another washer to increase the mass of the pendulum and observe the difference in time to complete one full swing or the number of swings completed in a fixed amount of time

C. Students recognize that objects with greater mass or greater speed have more kinetic energy.

- observe two vehicles with different masses traveling on the same track and identify which vehicle is traveling faster (has more kinetic energy)
- observe two people walking at different speeds and identify which person has more kinetic energy
- observe a fan set at different speeds and identify that the blades have more kinetic energy at higher speeds
- compare the typical speeds that different vehicles (a car, a train, or a plane) travel and determine which has more kinetic energy

Prerequisite Skill: Students can differentiate between more/less mass and more/less speed.

Key Terms

kinetic energy, motion, mass, speed

Additional Resources or Links

- This is a video on potential and kinetic energy.

  https://www.youtube.com/watch?v=IqV5L66EP2E&vl=en

- This is a video on potential and kinetic energy.

  https://www.youtube.com/watch?v=c0KSjpPoNeQ

- This is an interactive video on the potential and kinetic energy of a skateboarder.

  https://phet.colorado.edu/sims/html/energy-skate-park-basics/latest/energy-skate-park-basics_en.html

- This is a pendulum activity.

  https://serpmedia.org/scigen/e1.3.html

Cross-Content Standards

- Language Arts: Text Features (8.1.6.f), Explicit Evidence (8.1.6.i), and Cause/Effect (8.1.6.j)
- Mathematics: Proportional Relationship (8.2.1.b) and Volume (8.3.3.d)

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SC.8.4.3.B

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Develop a model to describe that when the arrangement of objects interacting at a distance changes, then different amounts of potential energy are stored in the system. Assessment is limited to two objects and electric, magnetic, and gravitational interactions.	Use data to describe the relationship between potential (stored) energy and the height of an object.	Use data to describe that the amount of potential (stored) energy in a stationary object increases with increasing height and decreases with decreasing height.	Use data to identify which object has more or less potential energy based on its distance from the bottom of a surface.	Recognize that an object has greater potential energy at a greater height.

Standard Clarification

Students will describe the relationship between potential energy and the height of an object. Students will use data to help describe the amount of potential energy in objects. Potential energy is the stored potential of an object that is not moving to do work. The higher an object rests, the more potential energy it stores to do work once it starts moving. This can be seen in the amount of work it does (speed or distance traveled over time) when it moves. An object that starts moving from a greater height will move faster or travel farther than an object with the same mass that starts moving from a lower height. For the focus of this standard, students are not expected to understand that potential energy is converted to kinetic energy when an object starts to move.

Target Activities for Access Point A

A. Students use or collect data to observe the pattern that the potential energy of objects increases with increasing height and decreases with decreasing height.

- compare data about the speed and heights of different roller coasters to identify and rank the roller coasters from greatest to least potential energy
- compare data about the speed or distance of a ball rolling down a ramp at different heights and rank the heights from greatest to least potential energy
- drop a book from different heights and compare the sound of the impact (a louder sound indicates a greater force) and identify and rank the heights from least to greatest potential energy

Scaffolding Activities for Access Points B and C

B. Students use or collect data to identify greatest and least potential energy.

- compare data about the speed and heights of different roller coasters to identify which roller coaster has the greatest and least potential energy
- drop a ball from different heights and observe the change in the height of the bounce to identify at which heights the ball has the greatest and least potential energy
- hold a washer attached to a string (pendulum) at different angles and identify the positions in which the washer has the greatest and least potential energy

C. Students observe objects at different heights to recognize that potential energy is greatest at the highest point.

- drop a ball from different heights into flour and observe the size of the crater made by the impact to identify the height at which the ball had the greatest potential energy
- drop an object into a pool or bucket of water from different heights and observe the size of the splash to identify the height at which the object had the greatest potential energy

Prerequisite Skill: Students recognize height as a measure of the distance from the ground.

Prerequisite Skill: Students have a general understanding that potential energy is the stored potential of an object that is not moving to do work and recognize that potential energy is different than kinetic energy.

Key Terms

greatest, least, less, more, pendulum, potential energy

Additional Resources or Links

- This is a graph showing the potential and kinetic energy in a roller coaster.

  https://net.pbslearningmedia.org/resource/hew06.sci.phys.maf.rollercoaster/energy-in-a-roller-coaster-ride/

- This is a visual showing the potential and kinetic energy of a hammer and a bow and arrow.

  https://www.britannica.com/science/potential-energy

- This is an interactive video showing the potential and kinetic energy of a skateboarder.

  https://phet.colorado.edu/sims/html/energy-skate-park-basics/latest/energy-skate-park-basics_en.html

- This is a pendulum activity.

  https://serpmedia.org/scigen/e1.3.html

Cross-Content Standards

- Language Arts: Text Features (8.1.6.f), Explicit Evidence (8.1.6.i), and Cause/Effect (8.1.6.j)
- Mathematics: Distance between Two Points (8.3.3.c)

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SC.8.9 Heredity: Inheritance and Variation of Traits

SC.8.9.4.A

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Develop and use a model to describe why structural changes to genes (mutations) may result in harmful, beneficial, or neutral effects to structure and function of organisms. Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.	Use models to observe that changes in the physical traits of organisms of the same species (caused by genetic mutation) may or may not affect their ability to survive.	Use models to identify changes in the physical traits of individuals of the same species and describe how changes may affect an organism's ability to survive or not.	Using a model of a typical organism and a changed organism of the same species; identify the physical trait that changed or whether the change is helpful or harmful.	Recognize the changed organism when given a model of a typical organism and a changed organism of the same species.

Standard Clarification

Students will observe pictures and/or data about individual plants or animals in a population of the same species with given survival needs and habitat type. Students will identify differences in fur/skin/leaf pattern, leaf/flower/eye color, tail/tongue/limb/stem length, or other physical traits caused by genetics rather than environment or injury and predict whether the change increases, decreases, or has no effect on the individual's ability to survive and reproduce. If the change is beneficial, the trait will be passed to offspring and the number of individuals with the trait in the population will increase. If the trait is harmful, the individual will either not survive or not reproduce. If the change has no obvious effect, it may or may not be passed randomly to offspring or increase within the population, and students should recognize that some genetic changes have no known effect on the survival of an individual. This standard is closely related and easily confused with standard 8.10.5.D.

Target Activities for Access Point A

A. Students use models to identify changes in the physical traits of an organism and determine whether and how that change affects the organism's ability to survive.

- investigate changes in a physical trait among individuals of the same species to identify how that change affects the individual's ability to hide, find food, escape predators, or find a mate

Scaffolding Activities for Access Points B and C

B. Students use models to identify changes in the physical traits of an organism and determine whether the change is helpful or harmful to the survival of the organism.

- compare two or more individuals of the same species, one with a changed trait (beak shape, foot shape, extra toe, atypical shape of body part, or unusual pattern or color) and, based on given information about the individual's food, habitat, or other needs, determine whether the change increases or decreases the individual's ability to eat, run, climb, mate, or hide

C. Students recognize an organism with a changed trait.

- compare two individuals of the same species, one with typical traits and one with an obviously changed trait (beak shape, foot shape, extra toe, atypical shape of body part, or unusual pattern or color), and identify what is different

Prerequisite Skill: Students name physical traits of animals (beak shape, feather length, body size, number of legs, length of tail, webbed toes, type/color/pattern of skin covering: hair, fur, feathers, scales) and plants (leaf shape, number of leaves, flower shape and color, stem length, root depth, fruit/nut/seed type, taste).

Prerequisite Skill: Students observe variations in traits of individuals within the same species to understand that there can be differences within the same species.

Key Terms

harmful, helpful, individual, organism, species, survive, trait

Additional Resources or Links

- This is an article on animal adaptations and survival.
  http://www.primaryhomeworkhelp.co.uk/adaptation.htm
- This is a bird beak activity.
  *http://www.askmrcscience.net/sitebuildercontent/sitebuilderfiles/darwinsfinches.pdf
- This is a bird beak activity.
  *https://www.galapagos.org/wp-content/uploads/2012/04/Beak-of-the-Finch-Activity.pdf

*Please note that finch diagrams typically represent different species that evolved over time as a result of the change in trait. The focus of this standard is on a single change in an individual within a species and whether that change is beneficial or harmful to the survival of the individual.

Cross-Content Standards

- Language Arts: Cause/Effect (8.1.6.j) and Relevant Evidence (8.2.1.c)

SC.8.9.4.B

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Gather and synthesize information about technologies that have changed the way humans influence inheritance of desired traits in organisms.	Use information to describe ways that humans have influenced the physical traits of plants and animals.	Describe physical traits that may be desirable or undesirable and identify a way humans select that trait for future generations of offspring.	Identify which individual would most likely produce offspring with a given desired trait.	Recognize an organism that has a trait that fits a given need.

Standard Clarification

Students will describe ways that humans have influenced the observable characteristics of plants and animals. The focus of this standard is on individual plants and animals with a specific trait that humans selected in order to produce more individuals with that trait.

Target Activities for Access Point A

A. Students identify traits that meet or do not meet a particular need or desire of humans.

- compare two traits for the same organism and determine which is more/less desirable or able to meet a given need (one cow produces more milk than another, one horse is taller than another and can jump higher, one cat has stripes and the other has spots)

A. Students determine ways that humans affect the growth of organisms (animals or plants).

- identify which types of plants to grow (watermelons with or without seeds, sweet corn instead of colorful corn, orange pumpkins instead of white pumpkins)
- compare the fruit of domestic plants to plants grown in the wild (bananas grown from domestic plants have fewer seeds than those grown in the wild and berries grown from domestic plants are larger than berries found in the wild)
- study data showing the increase in the variety of cat and dog species over time

Scaffolding Activities for Access Points B and C

B. Students select an organism that meets a particular need or desire of humans.

- choose between different dog breeds to serve a human purpose by selecting the dog that is small enough to keep in a lap, that is large enough to pull a sled, that has long fur to keep warm in snow, or that has short fur to keep cool in the heat
- choose between different plants based on human preference by selecting plants that grow fruits that are sweet instead of sour, corn plants that grow larger cobs instead of smaller cobs, trees that grow green apples instead of red apples, or plants with blue flowers instead of red flowers

C. Students select organisms with traits that meet an identified human need.

- recognize which animal is small or large, which animal has thick, thin, or soft fur, and which animal is a desired color
- select a plant that produces fruit instead of nuts, a tree that produces more fruit instead of less, and a horse that is larger to pull more weight

Prerequisite Skill: Students identify animal or plant traits that are helpful in a given environment.

- identify whether a shorter or taller plant will get more sunlight in the jungle
- identify whether a smaller or larger fish can hide from predators better in a pond

Prerequisite Skill: Students determine which animal or plant has the traits needed to survive in an environment.

- identify organisms that can live in the water (fish with fins to swim and gills to breathe), animals that can live in the jungle (giraffes have long necks and are tall to reach leaves for food), and plants that can survive where there is little ground space or sunlight (vines can climb to reach sunlight and spread out)

Key Terms

traits

Additional Resources or Links

- This is an article about different dog breeds and their purpose. https://www.petbutler.com/blog-dog-breeds-original-jobs/#:~:text=Originally%20bred%20to%20herd%20sheep,sentinels%2C%20and%20in%20obedience%20work

- This is a video on fruits and vegetables that were adapted by humans. https://youtu.be/EkJnOWGCejQ

Cross-Content Standards

- Language Arts: Context Clues (8.1.5.b), Author's Purpose (8.1.6.a), and Explicit Evidence (8.1.6.i)
- Mathematics: Congruent Two-Dimensional Shapes (8.3.2.b) and Similar Two-Dimensional Shapes (8.3.2.c)

SC.8.10 Natural Selection and Adaptations

SC.8.10.5.A

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. Assessment does not include the names of individual species or geological eras in the fossil record.	Use data and evidence in Earth's fossil record (fossils found in rock or ice layers) to investigate changes in Earth's environments and life forms over time.	Use evidence of the fossil record (types of organisms) to identify that different environments and organisms existed at a given location over time.	Identify one or more fossils that would be found in an environment, or given one or more fossils, identify an environment in which the fossil or fossils could be found.	Recognize a fossil in its environment.

Standard Clarification

Students will use evidence of Earth's fossil record to identify changes in Earth's environment (dry land that was at one time covered by water or water in areas that was at one time covered by dry land) and how life forms have changed because of those changes in the environment.

Target Activities for Access Point A

A. Students use models or diagrams of rock layers containing fossils that lived in different environments to identify the type of environment that existed when each fossil was a living organism.

- describe the changes in environments (from land to water, from water to land, from desert to forest, from forest to grassland) that can be determined from fossils in the rock layers
- describe changes in the types of organisms living in a given location that can be determined from changes in the environment

Scaffolding Activities for Access Points B and C

B. Students match fossilized organisms, seashells, or leaves to the environments in which they once lived.

- select appropriate toy animals, plants, or seashells to make impressions (fossils) that match a given environment
- look at pictures of fossils and identify the environments in which the fossils would be found

C. Students recognize that the impression of a seashell, a leaf, or the hard part of an organism is a fossil.

- make an impression of a seashell, a leaf, or another natural object in clay
- identify fossils from illustrations

Prerequisite Skill: Students recognize different environments (desert, jungle, ocean, grassland, forest) and can identify animals that would live in each environment. Students recognize organisms as living things and that hard parts of their bodies can become fossils after they die.

Key Terms

environment, fossil, organism

Additional Resources or Links

- This is a virtual tour of the National Museum of Natural History.
  https://naturalhistory.si.edu/visit/virtual-tour
- This is an article with images showing models of rock layers.
  http://www.prehistoricplanet.com/news/index.php?id=48

Cross-Content Standards

- Language Arts: Setting (8.1.6.b) and Identify Evidence (8.2.2.b)

SC.8.10.5.B

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Apply scientific ideas to construct an explanation for the anatomical similarities and differences among and between modern and fossil organisms to infer evolutionary relationships.	Use models and information about the physical traits of fossilized organisms and modern organisms to investigate the evolutionary relationships between organisms.	Describe one or more similarities or differences that show modern organisms are related to or unrelated to fossilized organisms.	Identify a physical trait of a modern organism that is most similar to a fossilized organism.	Recognize an organism that could have formed a given fossil.

Standard Clarification

Students will use models to investigate the evolutionary relationship between organisms. Students will use information about fossilized organisms and modern organisms to determine the relationship between the organisms.

Target Activities for Access Point A

A. Students identify similarities or differences between living organisms and fossilized extinct organisms to understand whether they are related or not.

- create a Venn diagram to show similarities/differences between modern organisms and fossilized organisms
- journal about similarities and differences between modern organisms and fossilized organisms and explain why they are similar or different (closely related/unrelated)

Scaffolding Activities for Access Points B and C

B. Students identify a physical trait of an organism living today and compare it to the traits of a fossilized organism from long ago.

- identify which trait(s) of a fossilized organism are similar to an organism of today
- match organisms to fossilized organisms based on physical traits

C. Students recognize models of different fossils that could have formed from organisms.

- compare three fossils and an organism to identify which fossil looks similar to the organism
- compare three organisms and a fossil to identify which organism looks similar to the fossil

Prerequisite Skill: Students recognize organisms as living things and that hard parts of their bodies can become fossils after they die.

SC.8.10 Natural Selection and Adaptations

Key Terms

difference, extinct, fossil, organism, physical traits, related, similarity

Additional Resources or Links

- This is an article about the evolution of the horse with images of fossils.
  http://www.primaryhomeworkhelp.co.uk/adaptation.htm

Cross-Content Standards

- Language Arts: Relevant Evidence (8.2.1.c) and Compare/Contrast (8.1.6.j)
- Mathematics: Similar Two-Dimensional Shapes (8.3.2.c)

SC.8.10.5.C

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	Use evidence to identify physical traits of organisms that help them survive and reproduce in a specific environment.	Identify one or more physical traits of an organism or organisms that will be helpful or harmful to the survival and/or reproduction of the organism or organisms in a specific environment.	Identify one or more physical traits that would help organisms survive and reproduce in a specific environment.	Recognize the organism that would best survive in a specific environment.

Standard Clarification

Students will explain how physical traits help organisms survive and reproduce in certain environments.

Target Activities for Access Point A

A. Students identify traits that increase or decrease the chance that an organism will survive and reproduce in a given environment.

- identify traits that would reduce survival in a given environment (thick fur in hot desert or large leaves in dry desert)
- list physical traits that help an organism survive and reproduce in its environment
- create a Venn diagram of traits that help organisms survive in certain environments
- play a game with marbles or building blocks of various colors—some dull colors that blend into the background and some brighter colors that stand out from the background—where students cover their eyes then open them quickly, grab what they can in a few seconds, and discuss why certain objects were more likely to be grabbed than others

Scaffolding Activities for Access Points B and C

B. Students identify which traits help an organism survive and/or reproduce in its environment.

- identify a physical trait that helps an organism survive (fish have fins to move through the water, birds have wings to fly in air, polar bears have thick fur to stay warm in snow)
- identify a physical trait that helps an organism reproduce in the environment (being brightly colored to be noticed by a mate, laying eggs that don't have to be cared for in water)
- identify human physical traits that help humans survive during different seasons (we are warm-blooded so our body temperature stays the same, we have the ability to build houses, we have the ability to make decisions about clothing and food) and discuss how changing our environment or traits could affect our comfort and survival

C. Students identify an organism that has the traits to survive in a particular environment.

- match animals and plants to their environments (polar bears live where there is snow and ice, fish live in water, birds need space to fly and places to nest)
- recognize environments that are not suitable for specific plants and animals

Prerequisite Skill: Students name the physical traits of animals (beak shape, feather length, body size, number of legs, length of tail, webbed toes, type/color/pattern of skin covering: hair, fur, feathers, scales) and plants (leaf shape, number of leaves, flower shape and color, stem length, root depth, fruit/nut/seed type, taste).

Key Terms

genetics, population, probability, reproducing, traits

Additional Resources or Links

- This is an article on animal adaptations and survival.

  http://www.primaryhomeworkhelp.co.uk/adaptation.htm

Cross-Content Standards

- Language Arts: Setting (8.1.6.b) and Explicit Evidence (8.1.6.i)

SC.8.10.5.D

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. Assessment does not include Hardy Weinberg calculations.	Use data to explain that individual organisms with a beneficial physical trait are better able to survive and reproduce than individuals without the trait, which increases the number of individuals with that trait.	Use data to determine whether the number of individuals with or without a specific physical trait will increase or decrease within a population over time.	Identify that the number of individuals with a beneficial physical trait will increase within a population over time.	Recognize whether a given organism has a specific physical trait.

Standard Clarification

Students will understand that individual organisms that have beneficial physical traits are better able to survive and reproduce. Beneficial traits are passed on to the next generation (offspring), which increases the number of individuals in a population that have the beneficial trait.

Target Activities for Access Point A

A. Students compare simple graphs, tables, or charts showing the number of individuals in a population of plants or animals with a given trait and without the trait over a period of time to identify that the number of individuals with the trait increased, while the number of individuals without the trait decreased.

- compare data showing the number of individuals in a species that are albino and are not albino to identify why albino populations are rare and will not increase unless there is a change in the environment that makes albino the beneficial trait for survival or reproduction
- compare data showing the number of individuals in a population with and without beneficial traits that help an organism reproduce or find a mate (peacocks with more attractive tails, different flower colors, sweeter varieties of fruit, polar bears of different size and weight)
- study data showing the shift in a moth population from white to black to identify that the color black became the beneficial trait as the environment changed and black became better camouflage

Scaffolding Activities for Access Points B and C

B. Students identify that the number of individuals with a beneficial trait will increase within a group (family, population).

- discuss traits students share with their parents, siblings, cousins, or other family members (curly hair, freckles, eye color) and make the connection that the number of people with the trait increased as the number of family members increased
- compare two organisms, one with a beneficial trait and the other without the beneficial trait, and identify which organism will show an increase in population over time
- listen to a story about an organism with a certain trait that has babies, grandbabies, etc. with the same trait and recognize that the number of organisms with the trait increases with each new generation over time

C. Students select pictures of animals or plants with a specific trait.

- select a picture of a bear when asked to indicate which animal has sharp teeth
- select a picture of a cow when asked to indicate which animal has flat teeth

Prerequisite Skill: Students name physical traits of animals (beak shape, feather length, body size, number of legs, length of tail, webbed toes, type/color/pattern of skin covering: hair, fur, feathers, scales) and plants (leaf shape, number of leaves, flower shape and color, stem length, root depth, fruit/nut/seed type, taste).

Key Terms

organism, population, reproduce, trait

Additional Resources or Links

- This is a video on the specific mutation that turned moths black during the Industrial Revolution

  https://www.bbc.com/news/science-environment-36424768

Cross-Content Standards

- Language Arts: Setting (8.1.6.b) and Explicit Evidence (8.1.6.i)
- Mathematics: Scatter Plots (8.4.1.a) and Line of Best Fit (8.4.2.a)

SC.8.11 Space Systems

SC.8.11.6.A

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	Use models of the Earth-sun-moon system to investigate cycles that cause observable monthly lunar patterns and yearly seasonal patterns on Earth.	Use models of the Earth-sun-moon system to observe and describe the cycles that cause the illumination of the moon (new, quarter, half, full), and the seasons (winter, spring, summer, autumn) on Earth.	Identify moon phases (new, half, full) or seasons (winter, spring, summer, autumn) and recognize that they occur in a recurring pattern.	Recognize the moon when it is lit by the sun, or recognize summer and winter as recurring seasons.

Standard Clarification

Students will use models to understand the phases of the moon and the seasons as caused by the movement of Earth and the moon around the sun. The moon orbits Earth. Earth and the moon orbit around the sun. We see the moon when it is illuminated by the sun. The positions of the moon and Earth in relation to the sun cause us to see different amounts of the illuminated portion of the moon from Earth, which results in moon phases. The angle of sunlight shining directly or indirectly on different parts of Earth causes the seasons to change. When the angle of sunlight is most direct on a location, that area experiences summer, and when the angle is least direct, the area experiences winter. Students should avoid the misconception that seasons occur due to the changing distance of Earth from the sun as it orbits. Students are not expected to understand that Earth tilts on its axis, the role of Earth's tilt as it orbits the sun as the cause of the changing angle of sunlight, or that seasons are different in the northern and southern hemispheres during the same time of year as a result.

Target Activities for Access Point A

A. Students use models to show the movements of Earth and the moon around the sun that cause the phases of the moon (illumination) and the seasons (the angle and amount of sunlight shining directly or indirectly on different parts of Earth's surface) to change.

- use a light source (flashlight) to represent the sun and two balls to represent Earth and the moon and demonstrate the movement of Earth and the moon around the sun
- shine a light source on two balls representing the moon and Earth and move the balls to different positions to demonstrate the different phases of the moon as seen from Earth
- shine a flashlight directly at a location on a large ball or object from a close distance and feel the heat from the light, then shine the flashlight indirectly at another location on the ball or object from the same distance and compare the amount of heat from the light
- shine a flashlight directly on a thermometer to observe the temperature change, then shine the flashlight indirectly on the thermometer to observe the difference in temperature change
- watch time-lapse videos and observe changes in the phases of the moon and seasons

A. Students participate in journal or calendar activities over a period of time to observe and record moon phases and changing seasons.

- draw or take pictures of the moon each day or evening for a period of time and compare those pictures to images of the moon at different phases
- measure the temperature and observe the weather changes over a period of time

Scaffolding Activities for Access Points B and C

B. Students use objects to model the phases of the moon.

- scrape away the cream in a sandwich cookie to model different phases of the moon
- shape dough or draw to model the phases of the moon

B. Students use evidence from models, videos, books, and observations of the outdoors to identify the season

- identify which clothes, shoes, or activities are typical for a given season
- identify the season based on weather and other environmental conditions

B. Students use models and calendars to understand that moon phases and seasons occur in cyclical patterns monthly and yearly.

- match seasons to months on the calendar
- draw the moon phases on a calendar
- model the recurrence of the seasons and moon phases

C. Students recognize the moon.

- indicate pictures of the moon illustrated in books
- differentiate the moon from stars in images of the night sky
- observe the moon in the night sky

SC.8.11 Space Systems

C. Students differentiate between summer and winter and recognize the recurring pattern of summer and winter.

- observe the weather (temperature, snow, rain), conditions of plants (no leaves in winter, flowers and growth in summer), types of clothing worn, seasonal foods available, and other key indicators of summer and winter
- discuss recurring events like holidays and birthdays, especially as they occur in summer and winter

Prerequisite Skill: Students recognize that Earth is under their feet and the sun and moon are in the sky.

Prerequisite Skill: Students recognize models and pictures of Earth, the sun, and the moon.

Prerequisite Skill: Students recognize the four seasons and the key features used to identify each season where they live.

Key Terms

angle, direct, Earth, indirect, moon, orbit, phases, seasons, sun

Additional Resources or Links

- This is an article with images of the moon phases.

  https://solarsystem.nasa.gov/moons/earths-moon/lunar-phases-and-eclipses/

- This is a musical video on the four seasons.

  https://www.youtube.com/watch?v=NavWWM2iTEw

- This page lists activities to investigate light sources at different angles.

  https://www.mooreschools.com/cms/lib/OK01000367/Centricity/Domain/3999/Flashlight%20Lamp%20Lab.pdf

Cross-Content Standards

- Language Arts: Organizational Patterns (8.1.6.j) and Relevant Evidence (8.2.1.c)
- Mathematics: Absolute Value and Temperature (8.1.2.c), Congruent Two-Dimensional Shapes (8.3.2.b), and Similar Two-Dimensional Shapes (8.3.2.c)

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SC.8.11.6.B

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Develop and use a model to describe the role of gravity in the motions within the galaxy and the solar system. Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of planets as viewed from Earth.	Use simple models of the solar system to investigate the motion of the moon around Earth and Earth around the sun due to the pull of gravity.	Use models of the sun, Earth, and the moon to describe that these bodies are kept in predictable orbits by the pull of gravity.	Use a model to identify the sun, Earth, and the moon as parts of the solar system or that they orbit together.	Recognize the sun or Earth as parts of the solar system.

Standard Clarification

Students will use models of the sun, Earth, and the moon to understand that the gravitational pull of objects on each other is responsible for the orbit of the moon around Earth and the orbit of the moon and Earth together around the sun. Large objects have a stronger gravitational pull than small objects, but all objects have gravitational pull. The focus of this standard is on the ability of gravity to hold celestial objects in orbit, rather than on how gravity works.

Target Activities for Access Point A

A. Students identify that there is a connection between the pull of gravity on objects, the pull of Earth on the moon, and the pull of the sun on the moon and Earth, causing their orbits within the solar system.

- demonstrate the downward pull of gravity by releasing objects at different heights
- demonstrate the orbit of one object around another object
- use scaled models of the moon and Earth or of the moon, Earth, and the sun to demonstrate their orbits
- recognize that the strength of the gravitational pulls of the sun, Earth, and the moon is based on their relative size

Scaffolding Activities for Access Points B and C

B. Students use a scaled model or diagram of the sun, Earth, and the moon to recognize that the moon and Earth orbit the sun together within the solar system.

- identify the sun, Earth, and the moon as parts of the solar system
- use scaled models of the sun, Earth, and the moon to demonstrate that Earth and the moon orbit the sun together
- demonstrate the orbit of one object around another

C. Students recognize the sun and Earth as part of the solar system.

- identify the sun and Earth in models or images of the solar system
- recognize the relative locations of Earth (under our feet) and the sun (in the sky)
- recognize the general appearance of the sun and Earth

Prerequisite Skill: Students understand what a model is and that models are used to help students study objects that are too small, too large, or too far away to observe directly or in person.

Prerequisite Skill: Students understand the general components of the solar system and its relative size compared to Earth.

Prerequisite Skill: Students understand the relative sizes of the sun, Earth, and the moon. (This concept is covered in standard 8.11.6.C but will help students with the concept of gravitational pull by objects of different sizes.)

Key Terms

galaxy, gravity, orbit, pull, relative, scale, size, solar system

Additional Resources or Links

- This is an activity using a washer, string, and a straw to demonstrate orbital paths.
  https://starchild.gsfc.nasa.gov/docs/StarChild/teachers/orbiting.html

Cross-Content Standards

- Language Arts: Organizational Patterns (8.1.6.j)
- Mathematics: Proportional Relationship (8.2.1.b)

SC.8.11.6.C

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Analyze and interpret data to determine scale properties of objects in the solar system. Assessment does not include recalling facts about properties of the planets and other solar system bodies.	Use scaled models to compare and describe the size of the sun, planets, and moons in the solar system.	Use scaled models to compare and describe the sizes of the sun, Earth, and the moon.	Use scaled objects or pictures representing the sun, Earth, and the moon to identify which is largest or smallest.	Recognize which of two objects in the Earth-sun-moon system is larger.

Standard Clarification

Students will understand that the sun is much larger than Earth and Earth is larger than the moon. The focus of this standard is on the relative sizes of the sun, Earth, and the moon within the solar system. Students are not required to know the relative sizes of other planets and their moons.

Target Activities for Access Point A

A. Students recognize the relative sizes of the sun, Earth, and the moon.

- order the sun, Earth, and the moon from largest to smallest or smallest to largest
- represent the relative sizes of the sun, Earth, and the moon using models, journals, or pictures
- select objects that could represent the relative sizes of the sun, Earth, and the moon

Scaffolding Activities for Access Points B and C

B. Students identify the sun as the largest and the moon as the smallest when comparing the sun, Earth, and the moon.

C. Students identify the sun and Earth as larger than the moon.

Prerequisite Skill: Students can order actual objects and images of objects from smaller to larger and larger to smaller.

Prerequisite Skill: Students recognize the sun, Earth, and the moon as objects in the solar system (This concept is covered in standard 8.11.6.B).

Key Terms

Earth, larger, model, moon, scale, smaller, sun

Additional Resources or Links

- This is a poster showing the relative sizes, location, and orbits of the sun, Earth, and the moon. https://www.teachstarter.com/au/teaching-resource/interplay-sun-earth-moon-poster/

Cross-Content Standards

- Language Arts: Organizational Patterns (8.1.6.j)

SC.8.14 History of Earth

SC.8.14.7.A

Standard/Indicator	Extension	Access Point A	Access Point B	Access Point C
Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. Assessment does not include recalling the names of specific periods or epochs and events within them.	Participate in making or using models of Earth's rock strata to explain that rock layers are very old and that their age is relative to their position within rock strata.	Participate in making or using models to explain that Earth's surface is made of rock layers that are very old and that older rock layers are found below younger rock layers.	Identify which layers are the oldest and the youngest when using a model of rock strata with more than two layers.	Recognize the bottom layer as older when using a model of rock strata with two distinct layers.

Standard Clarification

Students will develop or use models to understand that Earth's surface is made of rock layers. The older layers of rock were formed first and are found under the younger layers of rock. Earth's surface is made of different types of rock. When rock is exposed to the atmosphere, it can be weathered and eroded by wind and water. Molten rock from deep in the Earth can rise to the surface, where it cools and hardens. Different layers of rock can cover each other when different processes occur at different times in the same location. One location may have ancient rock formed quickly from hardened volcanic lava that is later buried by windblown sand, silt, and other sediments over thousands of years. The same area may later be covered by water and a new rock layer formed slowly by the deposition of shells and other sediments. These different layers may have different colors, degrees of hardness, and degrees of thickness as revealed by a cross section of the rock layers.

Target Activities for Access Point A

A. Students make their own model of rock layers and identify that the position of each rock layer represents the relative age of that layer.

- form a cake with multiple layers
- create a model of rock layers using different colors of sand
- place different sizes of sediments (clay, sand, and pebbles) in a jar of water, shake it to mix the contents, and watch the layers settle to observe the order in which the different types of sediment settled (the pebbles will settle first, representing the oldest layer, the sand will settle as the next layer, and the clay will settle last, representing the youngest layer)

Scaffolding Activities for Access Points B and C

B. Students identify the relative ages of the top and bottom layers when given a model of rock layers with more than two layers.

- look at a simple diagram of Earth's layers and identify the oldest and youngest layers
- create models of Earth's surface by layering materials (bread, towels, paper, dough) on top of each other and identify the layer that was laid down first as the oldest layer and the layer on top as the youngest layer

C. Students identify the bottom of two layers as the older layer when given a model representing rock strata.

Prerequisite Skill: Students understand the concept of layers and layering.

- observe the layers and the differences in the layers in a candy bar, a layered cake, or a sandwich
- create layers using different colors of sand or modeling clay

Key Terms

bottom, layers, oldest, rock strata, top, youngest

Additional Resources or Links

- This is a video on rock layers.

  https://clarkscience8.weebly.com/law-of-superposition--index-fossils.html

- This is a video on rock layers.

  https://www.youtube.com/watch?v=S-5ATLIU59g

Cross-Content Standards

- Language Arts: Antonyms (8.1.5.d), Organizational Patterns (8.1.6.j), and Identify Evidence (8.2.2.b)

Alternate Science Instructional Supports for NSCAS Science Extended Indicators Grade 8