South Carolina
Alternate Assessment (SC-Alt)

Science Extended Standards

Office of Assessment
South Carolina Department of Education

Mick Zais, Ph.D.
State Superintendent of Education

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South Carolina Educators

Lisa Borden
Outreach Coordinator
Program for Deaf and Hard of Hearing
South Carolina School for the Blind

Anna Faust
Special Education Teacher
Lexington School District 1

Kristina Harding
Special Education Teacher
Greenville County School District

Cole Holman
Science Instructional Coach
Greenville County School District

Nancy Kramer
Special Education Teacher
Richland School District 1

Angela Mills
Science Teacher
Berkeley County School District

Deanna Parish
Special Education Teacher
Charleston County School District

Julia Salmon
Special Education Teacher
Darlington County School District

Linda Schoen-Giddings
Retired Science Educator

American Institutes for Research (AIR) Staff

Heather Williams
Science Specialist

Lynnett Wright
Alternate Assessment Specialist

June Zack
Test Development Lead

South Carolina Department of Education Staff

Kathy Ortlund
Science Specialist
Office of Assessment

Elizabeth Stout
Consultant for Students with Mental Disabilities
Office of Exceptional Children

Suzanne Swaffield
Coordinator, Alternate Assessment
Office of Assessment

Introduction

The *South Carolina Alternate Assessment (SC-Alt): Science Extended Standards* was developed to provide guidance to teachers for including students with significant cognitive disabilities in challenging academic instruction. This extended standards document for science replaces the *SC-Alt Science Assessment Standards and Measurement Guidelines* (*ASMG*), published by the South Carolina Department of Education in 2008. This revision of the *ASMG* is intended to make the general education indicators and extended standards more useful for classroom instruction and test development.

In 2005, the *South Carolina Science Academic Standards* (*SCSAS*) was published. That document, which sets forth the state's academic standards for general education in science, served as the basis for the *ASMG.* It is also the basis the present document, the *South Carolina Alternate Assessment (SC-Alt): Science Extended Standards.* All of the academic standards and indicator statements that appear in this document have been selected—and are cited verbatim—from the original 2005 standards document. This document contains examples of strategies based on the three symbolic levels of communication so that students with significant cognitive disabilities will be able to access the content of the general education indicators. The intended purpose of this organizational structure is to guide special education teachers in linking their classroom instruction to the state academic standards and to provide specific content to developers of the South Carolina Alternate Assessment (SC-Alt), the state assessment designed for administration for these students.

All of the general education indicators, which are taken directly from the 2005 state standards document, appear in tables in this extended standards document. Each of these tables for the individual grade levels (grade bands 3 through 5 and 6 through 8) is prefaced by two statements: the original general education standard and the extended standard. The tables themselves contain five columns:

- **Indicator—**the general education indicator

- **Essential Knowledge—**a statement describing the subject-matter content that is drawn from the *South Carolina Science Academic Standards Support Guide* (2007) and is the required focus of the particular indicator at this level of instruction

- **Communication Levels**—descriptions of the three levels of symbol usage that students with significant cognitive disabilities use to communicate and that therefore impact the ways that academic content may be presented, taught, and assessed:

  Abstract Symbolic. Students who use *abstract symbolic* communication are those who typically use a vocabulary of pictures, picture symbols, and words to communicate. They recognize some sight words and numbers and understand abstract concepts such as yesterday and happy or sad.

  Concrete Symbolic. Students at the *concrete* level of communication are beginning to use pictures or other symbols to communicate. They primarily use *concrete symbols* (e.g., eat, drink, play, "more."

Pre-Symbolic. Students at the *pre-symbolic* level may not yet have a consistent system of communication. They may use gestures, eye gaze, and purposeful movement toward objects and sounds to indicate wants or needs. For example, students may point to or hold up a cup to indicate they are thirsty. Some students at the *pre-symbolic* level of communication may still be at the awareness level of communication and may communicate by crying or vocalizing but they may not yet demonstrate purposeful communication.

Format of the Extended Science Standards for All Grade Levels
(Grade Bands 3–5 and 6–8)

These are the second **general education standard** (cited verbatim from the 2005 *SCSAS*) and the **extended standard** for grade 4.

Grade 4

STANDARD 4-2

Standard 4-2: The student will demonstrate an understanding of the characteristics and patterns of behavior that allow organis survive in their own distinct environments.

Extended Standard: The student will demonstrate an understanding that organisms have special characteristics and behavior allow them to survive in different environments.

This is the first **indicator** for standard 4-2 (cited verbatim from the 2005 *SCSAS*).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-2.1 Classify organisms into major groups (including plants or animals, flowering or nonflowering plants, and vertebrates [fish, amphibians, reptiles, birds, and mammals] or invertebrates) according to their physical characteristics.	Organisms can be classified into groups. *Vertebrates* have backbones and can be grouped into fish, amphibians, reptiles, birds, and mammals—all of which have distinct characteristics such as gills, feathers, or fur. *Invertebrates* do not have backbones but may have shells or be soft like jellyfish or worms. Some plants produce flowers while other plants do not.	Classify organisms on the basis of several characteristics (e.g., vertebrates with hair, invertebrates with a hard shell).	Classify organisms on the basis of a physical characteristic (e.g., animals with a backbone).	Identify major groups of or (e.g., plants, animals).

These are the three levels of symbolic communication—**abstract symbolic**, **concrete symbolic**, and **pre-symbolic**—that guide access to the expectations of the general education indicators.

This is the "**essential knowledge**" required by the standard and its indicator—the required subject-matter focus of the first indicator for standard 4-2.

All of the standards and indicators in the *South Carolina Science Academic Standards* were developed on the basis of the cognitive process dimension put forth in the revised taxonomy of Benjamin Bloom. (See appendix A.) Accordingly, the revised Bloom's taxonomy also guided the development of this extended standards document, which is designed to enunciate the appropriate science expectations for the instruction and assessment of students with significant cognitive disabilities.

Science Extended Standards

Grade Band 3–5

Grade 3

STANDARD 3-1

Standard 3-1: The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

Extended Standard: The student will demonstrate an understanding of the process skills necessary to conduct a scientific investigation.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-1.1 Classify objects by two of their properties (attributes).	Objects have properties that can be identified. Objects may be grouped on the basis of the similarities and differences in their properties.	Classify objects on the basis of their similarities and differences.	Match objects on the basis of two properties that they have in common.	Match objects on the basis of a given property.
3-1.2 Classify objects or events in sequential order.	Objects or events can be placed in sequential order according to a particular property or on the basis of what occurred first, second, and so forth.	Classify objects or events by putting them in sequential order (e.g., life cycles, relative sizes from small to large).	Identify the sequential order of a group of objects on the basis of one attribute.	Recognize the order of common events (e.g., daily morning activities, daily meals).
3-1.3 Generate questions such as "what if?" or "how?" about objects, organisms, and events in the environment and use those questions to conduct a simple scientific investigation.	A testable question is one that leads to a plan for conducting a scientific investigation. *(Student-generated questions may result from previous knowledge, experiences, or curiosity.)*	Plan a scientific investigation based on a student-generated question.	Generate a testable question that could lead to a scientific investigation.	Plan a simple scientific investigation based on student interest.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-1.4 Predict the outcome of a simple investigation and compare the result with the prediction.	The outcome of a simple investigation can be predicted on the basis of observations and previous knowledge. The results of the investigation can then be compared with the prediction.	Predict the results of a simple investigation and compare the results with the prediction.	Predict the results of a simple investigation.	Predict the outcome of a simple action such as placing an ice cube in a dish.
3-1.5 Use tools (including beakers, meter tapes and sticks, forceps/tweezers, tuning forks, graduated cylinders, and graduated syringes) safely, accurately, and appropriately when gathering specific data.	Tools used in conducting a scientific investigation include beakers (to measure volume), meter tapes or sticks (to measure length), forceps/tweezers (to pick up small objects), tuning forks (to produce vibrations), and graduated cylinders (to measure volume). *(These tools are in addition to those introduced in earlier grades. All tools should be used safely and correctly.)*	Use tools appropriately in a simple investigation.	Match tools with their particular functions.	Identify tools to be used in a simple investigation.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-1.6 Infer meaning from data communicated in graphs, tables, and diagrams.	Inferences are made on the basis of previous knowledge and experiences and on the interpretation of data. Patterns observed in tables, graphs, and diagrams can be used to help make an inference.	Make an inference on the basis of data in simple tables, graphs, or diagrams.	Make an inference on the basis of a simple graph or diagram.	NA
3-1.7 Explain why similar investigations might produce different results.	Reasons why an investigation can produce different results are that the setup of the materials or the procedures were not identical, appropriate tools were not chosen or were not used properly, measurements were not taken accurately, or mistakes were made when the data were recorded.	Explain why results of investigations may be different.	Identify differences between investigation results when one experimental factor differed.	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-1.8 Use appropriate safety procedures when conducting investigations.	Important safety procedures in conducting investigations include wearing goggles and aprons, being careful with sharp objects or glass (*only teachers should clean up broken glass*), following all directions, and keeping the workplace neat. (*Hands should be washed after every activity*.)	Use safety procedures when conducting an investigation.	Recognize safety procedures such as washing hands or following directions.	Identify a piece of safety equipment (e.g., goggles, an apron).

Grade 3

STANDARD 3-2

Standard 3-2: The student will demonstrate an understanding of the structures, characteristics, and adaptations of organisms that allow them to function and survive within their habitats. (Life Science)

Extended Standard: The student will demonstrate an understanding that organisms have special traits and characteristics that allow them to survive in their habitats throughout the stages of their life cycle.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-2.1 Illustrate the life cycles of seed plants and various animals and summarize how they grow and adapt to conditions within their habitats.	Plants and animals go through *life cycles*. After *pollination*, seeds become seedlings and then grow to be mature plants. Some animals give birth to baby animals that look like small adults but grow and may change in size, shape, color, or type of covering. Some animals begin as eggs and undergo changes in form (*metamorphosis*).	Compare the life stages of organisms.	Illustrate the life stages of an organism (e.g., sequence pictures of the life cycle of a chicken: egg ➔ chick ➔ hen).	Identify the individual stages of an organism's life cycle (e.g., infancy, adulthood).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-2.2 Explain how physical and behavioral adaptations allow organisms to survive (including hibernation, defense, locomotion, movement, and camouflage for animals and seed dispersal, color, and response to light for plants).	Animals have physical adaptations that allow them to defend themselves, move around, find resources, hide, and obtain food. They also have behavioral adaptations such as *hibernating* and *migrating*. Plants have adaptations that allow them to disperse seeds, attract insects and animals, and obtain sunlight.	Explain how physical adaptations (e.g., color for camouflage, teeth for tearing or chewing food) and behavioral adaptations (e.g., plant stem bending toward the light, animals hibernating in winter) help an organism to survive.	Match physical adaptations to an organism's survival in its habitat (e.g., webbed feet for swimming, flower color for attracting pollinators).	Identify physical adaptations of organisms.
3-2.3 Recall the characteristics of an organism's habitat that allow the organism to survive there.	Organisms can survive only in an area where their basic needs (air, food, water, shelter, space) can be met. For example, grazing animals need lots of space to get food, trees grow where there is sufficient water or small insects find shelter under a fallen log.	Identify the characteristics of a habitat that organisms need in order to survive (e.g., a field of grass provides food for a herd of cows).	Identify the basic needs of organisms and recognize how those needs can be met in a habitat (e.g., a cactus has sufficient water in a desert, an owl finds shelter in a tree).	Identify basic needs of organisms (e.g., air, food, water, shelter, space).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-2.4 Explain how changes in the habitats of plants and animals affect their survival.	Rapid or slow changes to a habitat—as a result of natural disaster, climate change, the incursion of humans or plants and animals into a habitat—can make it difficult for organisms to survive and may even cause their *extinction*.	Predict the effect that changes in their habitats can have on plants and animals in terms of their survival.	Match changes in their habitats with the ability of plants and animals to survive there (e.g., the space available for trees to grow is reduced when new housing is built).	Identify a change in a habitat (e.g., a flood, tree cutting) and the effect it may have on the organisms living in that place.
3-2.5 Summarize the organization of simple food chains (including the roles of producers, consumers, and decomposers).	A food chain shows the flow of energy initially provided by the Sun and passed from plants to animals. The role of an organism is described by how it obtains energy. *Producers* obtain energy from the Sun and make their own food. *Consumers* obtain energy by eating other organisms (plants or animals). *Decomposers* obtain energy by breaking down and feeding on dead plants and animals.	Illustrate a simple food chain with a producer and two consumers.	Classify organisms as producers or consumers.	Identify green plants as producers and animals as consumers.

Grade 3

STANDARD 3-3

Standard 3-3: The student will demonstrate an understanding of Earth's composition and the changes that occur to the features of Earth's surface. (Earth Science)

Extended Standard: The student will demonstrate an understanding that Earth's surface features are composed of many different types of rocks and bodies of water.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-3.1 Classify rocks (including sedimentary, igneous, and metamorphic) and soils (including humus, clay, sand, and silt) on the basis of their properties.	*Igneous* rock is cooled and hardened magma or lava. *Sedimentary* rocks are sediments that have been pressed together and may contain fossils. *Metamorphic* rock has been changed from something else by heat and pressure. *Humus* is soil made of decaying organisms. *Sand* is a soil that feels gritty. *Clay* is a hard soil that becomes sticky when wet. *Silt* is a very powdery soil.	Compare rocks on the basis of the way they are formed (e.g., sedimentary, igneous) or compare soils on the basis of their properties.	Classify soils (e.g., humus, sand, clay) on the basis of their properties.	Recognize the difference between rocks and soils.
3-3.2 Identify common minerals on the basis of their properties by using a minerals identification key.	Physical properties of minerals include hardness, color, luster, texture, and magnetic attraction.	Identify minerals on the basis of their properties.	Recognize the properties of minerals that are used to identify them.	Identify minerals on the basis of one physical property (e.g., luster—shiny or dull, texture—rough or smooth).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-3.3 Recognize types of fossils (including molds, casts, and preserved parts of plants and animals).	Fossils are the remains of living things that existed long ago and have turned to rock. Fossils can be imprints (e.g., leaves, feathers, footprints) or actual parts of living things (e.g., shells, bones, teeth) that have turned to stone.	Identify fossils as the remains of living things that existed long ago.	Identify mold fossils by matching them with the type of organism that made the imprint.	Recognize a fossil.
3-3.4 Infer ideas about Earth's early environments from fossils of plants and animals that lived long ago.	Fossils give information about the environment in which the fossil was found. For example, fossils of water organisms found in the mountains indicate that the area had been under water at one time.	Explain how fossils give us information about the environment in which they are found.	Match a fossil to the type of environment it represents (e.g., a leaf indicates a possible forest).	NA
3-3.5 Illustrate Earth's saltwater and freshwater features (including oceans, seas, rivers, lakes, ponds, streams, and glaciers).	*Oceans* and *seas* are large bodies of salt water. *Rivers* are large flowing bodies of freshwater that usually empty into a sea or ocean. *Streams* are small, flowing bodies of freshwater. *Lakes* and *ponds* usually contain freshwater and are surrounded by land. *Glaciers* are large sheets of ice that cover land in mountains or near the poles.	Compare the characteristics of oceans, rivers, lakes, and glaciers.	Identify oceans, rivers, or lakes on the basis of their characteristics.	Identify an ocean as a body of water that has salt water.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-3.6 Illustrate Earth's land features (including volcanoes, mountains, valleys, canyons, caverns, and islands) by using models, pictures, diagrams, and maps.	Earth's land features include the following: *Volcanoes* are openings in Earth's surface from which lava flows. *Mountains* are places where the land is much higher than the land that surrounds it. *Valleys* are low lands between higher areas. *Canyons* are deep valleys with very steep sides. *Caverns* are large underground caves. Islands are areas of land surrounded by water.	Compare the characteristics of Earth's land features.	Identify Earth's land features on the basis of their characteristics.	Identify Earth's land features (e.g., mountains, valleys, islands).
3-3.7 Exemplify Earth materials that are used as fuel, as a resource for building materials, and as a medium for growing plants.	Earth is rich in resources that can be used for various purposes (e.g., fuels, building structures, growing plants).	Illustrate Earth resources that can be used for fuel, for building materials, or for growing plants.	Recognize soil as a resource for growing plants and stone as a resource for building.	Recognize soil as a resource that can be used for growing plants.
3-3.8 Illustrate changes in Earth's surface that are due to slow processes (including weathering, erosion, and deposition) and changes that are due to rapid processes (including landslides, volcanic eruptions, floods, and earthquakes).	(See indicator 5-3.1.)	(See indicator 5-3.1.)	(See indicator 5-3.1.)	(See indicator 5-3.1.)

Grade 3

STANDARD 3-4

Standard 3-4: The student will demonstrate an understanding of the changes in matter that are caused by heat.
Extended Standard: The student will demonstrate an understanding that the properties of matter can change with the addition or removal of heat.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-4.1 Classify different forms of matter (including solids, liquids, and gases) according to their observable and measurable properties.	*Mass* is how much matter is in an object. It can be measured using a balance. *Volume* is the amount of space an object takes up. *Observable properties*, which require the use of the senses to identify, include color, size, shape, shininess, texture, and odor. *Measurable properties*, which require the use of tools to identify, include mass, volume, temperature, and length. *Matter* can be classified as solids, liquids, and gases.	Classify forms of matter on the basis of their properties.	Identify properties of forms of matter.	Identify forms of matter (liquids and solids).
3-4.2 Explain how water and other substances change from one state to another (including melting, freezing, condensing, boiling, and evaporating).	*Melting* occurs when a solid is heated and changes to a liquid such as ice to water. *Freezing* occurs when heat is removed from liquid to form a solid such as water	Predict the results of processes that change the form of matter.	Illustrate changes in the form of matter (e.g., solid to liquid, liquid to solid).	Identify changes in the form of matter (e.g., solid to liquid, liquid to solid).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
	to ice. *Evaporation* (or boiling) occurs when heat is added to liquid to form gas such as water to vapor. *Condensing* occurs when a gas is cooled to form a liquid.			
3-4.3 Explain how heat moves easily from one object to another through direct contact in some materials (called conductors) and not so easily through other materials (called insulators).	*Conductors* are materials that allow heat to move through them easily. Metals are good conductors. *Insulators* are materials that do not allow heat to move easily through them. Plastic and wood materials are insulators.	Classify objects as conductors or insulators.	Exemplify objects that are conductors of heat.	Identify materials that conduct heat.
3-4.4 Identify sources of heat and exemplify ways that heat can be produced (including rubbing, burning, and using electricity).	Heat is produced when objects such as human hands are rubbed together or when objects such as wood or candles are burned. Household objects such as light bulbs, toasters, and ovens also produce heat by using electricity. The Sun is another source of heat.	Recall how heat can be produced.	Identify sources of heat.	Identify sources of heat.

Grade 3

STANDARD 3-5

Standard 3-5: The student will demonstrate an understanding of how motion and sound are affected by a push or pull on an object and the vibration of an object. (Physical Science)

Extended Standard: The student will demonstrate an understanding that the forces of push and pull affect the motion of an object and that sound is a result of vibrations (i.e., back and forth movements) of an object.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-5.1 Identify the position of an object relative to a reference point by using position terms such as "above," "below," "inside of," "underneath," or "on top of" and a distance scale or measurement.	The position of an object can be identified by using a reference point that describes relative location to another object (e.g., above, below). Measurable distance is the length between two locations.	Identify relative positions of objects and use a ruler to make simple measurements.	Identify the position of an object as "above," "below," "inside of," or "underneath" another object.	Identify the position of an object as "inside of" or "on top of" another object.
3-5.2 Compare the motion of common objects in terms of speed and direction.	*Direction* is the path/course along which something is moving. *Speed* is the rate at which an object moves.	Compare the direction (up as opposed to down) and speed (fast as opposed to slow) of moving objects.	Compare the speed of two moving objects (fast as opposed to slow).	Identify the directions of "up" and "down."
3-5.3 Explain how the motion of an object is affected by the strength of a push or pull and the mass of the object.	The motion of an object is affected by its mass and the strength of a push or pull on it. The stronger the push or pull, the faster the motion will be. The more mass the object has, the slower the motion when the push or pull is the same.	Compare the motion of objects with more or less mass when they receive strong or weak pushes or pulls.	Compare objects on the basis of their mass and recognize that a heavy object will move more slowly than a light object if they receive the same push.	Recognize a heavy object as opposed to a light object.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-5.4 Explain the relationship between the motion of an object and the pull of gravity.	The pull of gravity attracts objects to one another. Earth's gravity pulls objects toward the center of Earth.	Explain that gravity causes objects to fall toward Earth's surface.	Explain that when objects are thrown or dropped on Earth, they will fall down (toward Earth's surface).	Recognize that objects fall down when released.
3-5.5 Recall that vibrating objects produce sound and that vibrations can be transferred from one material to another.	Vibrations are back-and-forth movements that occur very quickly. Vibrations of materials that cause sound can travel through solids, liquids, and gases. Sound moves through some materials better than others. Sound cannot travel through an empty space.	Recognize that sound can travel through solids and through gases such as air.	Identify sound as vibrations.	Identify objects that make sound.
3-5.6 Compare the pitch and volume of different sounds.	The *pitch* of a sound is how high or low it is. *Volume* is the loudness or softness of a sound.	Compare the pitch and volume of different sounds.	Identify the pitch (high or low) and volume (loud or soft) of a sound.	Recognize the difference between loud and soft sounds.
3-5.7 Recognize ways to change the volume of sounds.	The volume of a sound is affected by the strength of its vibrations. When an object is struck or plucked harder rather than more softly, its vibrations will be made stronger, and its volume will thus become louder rather than softer. The closer the source of the vibrations, the louder the volume will be.	Recognize ways to change the volume of sounds.	Identify a change (softer or louder) in the volume of a sound.	Identify sounds by volume.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
3-5.8 Explain how the vibration of an object affects pitch.	Pitch depends on how fast an object is vibrating. The length and thickness of an object and the tightness of a string or wire affect the speed at which they vibrate as well as their pitch.	Illustrate the ways to change pitch.	Illustrate the ways to change pitch.	NA

Grade 4

STANDARD 4-1

Standard 4-1: The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

Extended Standard: The student will demonstrate an understanding of the process skills necessary to conduct a scientific investigation.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-1.1 Classify observations as either quantitative or qualitative.	NA	NA	NA	NA
4-1.2 Use appropriate instruments and tools (including a compass, an anemometer, mirrors, and a prism) safely and accurately when conducting simple investigations.	Tools used in conducting scientific investigations include a compass, an anemometer, a mirror, and a prism. *(These tools are in addition to those introduced in earlier grades. All tools should be used safely and correctly.)*	Use an anemometer (simply made with paper cups) to observe wind speed, and identify the four directions on a compass.	Identify a prism as a tool that can break up light into the colors of a rainbow.	Recognize a mirror as a tool for viewing a reflected image (e.g., of oneself).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-1.3 Summarize the characteristics of a simple scientific investigation that represent a fair test (including a question that identifies the problem, a prediction that indicates a possible outcome, a process that tests one manipulated variable at a time, and results that are communicated and explained).	A *fair test* is one in which only one factor (the variable) is changed. A *controlled scientific investigation* includes the following steps: 1. Identify a question. 2. State a prediction that answers the question. 3. Design a procedure that includes changing only one factor. 4. Record the data in tables, charts, diagrams, or graphs. 5. Compare the results with the prediction.	Summarize the characteristics of a simple investigation (*fair test*).	Identify the factor (*variable*) in a simple investigation that is being changed (*manipulated*).	NA
4-1.4 Distinguish among observations, predictions, and inferences.	*Observations* are the findings obtained by means of the five senses or through the use of scientific tools. *Predictions* are inferences made about what will happen in the future; they are based on observations, available data, and prior knowledge. A prediction is not a guess.	Compare observations and predictions to differentiate between them.	Predict a common event on the basis of observations (e.g., observe clouds to predict weather conditions).	Predict the outcomes of very common events (e.g., letting go of a ball).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-1.5 Recognize the correct placement of variables on a line graph.	NA	NA	NA	NA
4-1.6 Construct and interpret diagrams, tables, and graphs made from recorded measurements and observations.	Simple diagrams, tables, and graphs (pictograph or bar) that are constructed from recorded measurements or observations may be interpreted for meaning.	Construct and interpret simple diagrams, tables, and graphs.	Interpret diagrams (e.g., simple food chains, water cycle).	Recognize simple diagrams of common events (e.g., rain falling, Sun shining).
4-1.7 Use appropriate safety procedures when conducting investigations.	Important safety procedures in conducting investigations include wearing goggles and aprons, being careful with sharp objects or glass (*only teachers should clean up broken glass*), following all directions, and keeping the workplace neat. (*Hands should be washed after every activity.*)	Use safety procedures in conducting an investigation.	Recognize safety procedures such as washing hands or following directions.	Identify a piece of safety equipment (e.g., goggles, an apron).

Grade 4

STANDARD 4-2

Standard 4-2: The student will demonstrate an understanding of the characteristics and patterns of behavior that allow organisms to survive in their own distinct environments. (Life Science)

Extended Standard: The student will demonstrate an understanding that organisms have special characteristics and behaviors that allow them to survive in different environments.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-2.1 Classify organisms into major groups (including plants or animals, flowering or nonflowering plants, and vertebrates [fish, amphibians, reptiles, birds, and mammals] or invertebrates) according to their physical characteristics.	Organisms can be classified into groups. *Vertebrates* have backbones and can be grouped into fish, amphibians, reptiles, birds, and mammals—all of which have distinct characteristics such as gills, feathers, or fur. *Invertebrates* do not have backbones but may have shells or be soft like jellyfish or worms. Some plants produce flowers while other plants do not.	Classify organisms on the basis of several characteristics (e.g., vertebrates with hair, invertebrates with a hard shell).	Classify organisms on the basis of a physical characteristic (e.g., animals with a backbone).	Identify major groups of organisms (e.g., plants, animals).
4-2.2 Explain how the characteristics of distinct environments (including swamps, rivers and streams, tropical rain forests, deserts, and the polar regions) influence the variety of organisms in each.	Environments like swamps, rivers and streams, tropical rainforests, deserts, and polar regions have characteristics that allow a variety of animals and plants to survive there.	Explain how the characteristics of an environment influence which types of organisms are able to live there (e.g., animals with thick fur or a lot of blubber can survive in a polar region).	Match environments with the organisms that survive there.	Match a distinct environment with an organism that survives there (e.g., polar region and polar bear).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-2.3 Explain how humans and other animals use their senses and sensory organs to detect signals from the environment and how their behaviors are influenced by these signals.	Sight, hearing, taste, smell, and touch allow animals to find food and shelter, escape danger, and communicate. In addition to these five basic senses, some animals have specialized senses that allow them to survive (e.g., echolocation in bats, night vision in nocturnal animals).	Explain the relationship between the survival of specific organisms and their basic senses, specialized senses, and sensory organs (e.g., bats use echolocation to fly in the dark and locate food).	Match senses and sensory organs with tasks that allow the survival of organisms.	Identify the senses that a particular organism uses for a specific task.
4-2.4 Distinguish between the characteristics of an organism that are inherited and those that are acquired over time.	Some characteristics of organisms are *inherited* (i.e., have come from their parents) while other characteristics are *acquired* over time. Characteristics can be either *physical* or *behavioral*. Examples of inherited physical characteristics are color of fur and type of body structure. Examples of inherited behavioral characteristics are instincts in animals and responses to light, water, or gravity in plants. Some characteristics such as weight, hair length, injuries, and number of leaves can change over a lifetime.	Analyze and compare the characteristics of an organism that were inherited and those that were acquired over time.	Classify the characteristics of an organism that change over time as opposed to those that are inherited.	Identify characteristics that an organism has inherited from its parents.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-2.5 Explain how an organism's patterns of behavior are related to its environment (including the kinds and the number of other organisms present, the availability of food and other resources, and the physical characteristics of the environment).	To survive within an ecosystem, plants and animals exhibit certain *behaviors* such as sleeping, communicating, or obtaining resources. Patterns of behavior are related to an organism's environment. Changes in an environment can lead to changes in an organism's pattern of behavior.	Explain the relationship between the behavior of an organism and its environment.	Match a type of behavior with a change in the environment that can cause the behavior.	Identify a type of behavior seen in an organism (e.g., animals eating or finding food, seeds germinating in a moist environment).
4-2.6 Explain how organisms cause changes in their environment.	All organisms cause changes in the environment where they live. These changes can be harmful or helpful to the organism or the environment. For example, over-grazing by animals can lead to plant depletion, which, in turn, can lead to land erosion. Conversely, animal waste products fertilize the land. Humans change the environment in many ways. They cut down trees to build houses, pollute the air or water with chemicals, and plant trees and create parks.	Explain how organisms, including humans, can change the environment—both positively and negatively.	Match an organism with a change in the environment (e.g., a beaver built a dam and a pond was created).	Identify a change in the environment caused by an organism (e.g., a tree root has caused a crack in the sidewalk).

Grade 4

STANDARD 4-3

Standard 4-3: The student will demonstrate an understanding of the properties, movements, and locations of objects in the solar system. (Earth Science)

Extended Standard: The student will demonstrate an understanding of the properties, movements, and relative locations of Earth, the Sun, and the Moon.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-3.1 Recall that Earth is one of many planets in the solar system that orbit the Sun.	(See indicator 4-3.2.)	(See indicator 4-3.2.)	(See indicator 4-3.2.)	(See indicator 4-3.2.)
4-3.2 Compare the properties (including the type of surface and atmosphere) and the location of Earth to the Sun, which is a star, and the Moon.	Earth has a rocky surface with water and a gaseous atmosphere. It orbits the Sun. The Sun is a star that gives off light and heat. It is located at the center of our solar system. The Moon orbits Earth. It has a rocky surface but no water or atmosphere.	Compare the characteristics of Earth, the Sun, and the Moon.	Illustrate the location of Earth, the Sun, and the Moon in our solar system.	Identify the Sun and the Moon.
4-3.3 Explain how the Sun affects Earth.	The Sun produces heat and light, and the Sun's energy is the source of almost all energy on Earth.	Illustrate that the Sun provides Earth with heat and light and that light is needed by plants to make food.	Illustrate that the Sun provides Earth with heat and light.	Recall that the Sun provides Earth with heat and light.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-3.4 Explain how the tilt of Earth's axis and the revolution around the Sun results in the seasons of the year.	Earth revolves around the Sun once each year. Earth has seasons because it is tilted so that different parts of the world get more sunlight at different times of the year. When Earth is tilted toward the Sun, the season is summer; when the tilt is away from the Sun, it is winter.	Explain that seasons result from Earth's revolution around the Sun.	Explain that there are four seasons due to Earth's position relative to the Sun.	Identify Earth's four seasons.
4-3.5 Explain how the rotation of Earth results in day and night.	Earth rotates (spins) on its axis once each day. The Sun appears to rise in the east and set in the west. While one side of Earth faces the Sun and experiences day, the other side of Earth not facing the Sun experiences night.	Explain how the movements of Earth result in day and night.	Illustrate the relative positions of Earth and the Sun when it is day or night at a specific location on Earth.	Recognize day and night.
4-3.6 Illustrate the phases of the Moon and the Moon's effect on ocean tides.	Due to the varying amount of sunlight reflected by it, the Moon appears to change shapes. These shapes are called *phases*. The Moon and Earth pull on each other because of gravity. The Moon's pull on Earth makes the level of the oceans rise and fall. These changes in ocean levels are called *tides*.	Illustrate the sequence of the phases of the Moon.	Identify the full, quarter, and crescent phases of the Moon.	Identify the full and crescent Moon.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-3.7 Interpret the change in the length of shadows during the day in relation to the position of the Sun in the sky.	Objects on Earth cast shadows. The length of a shadow depends on the angle of the Sun's rays that are hitting the particular object.	Identify the time of day by the length of shadows.	Recognize that the length of shadows changes during the day.	Recognize a shadow.
4-3.8 Recognize the purposes of telescopes.	A telescope allows us to see objects in outer space.	Explain that a telescope is used to view objects in outer space.	Identify a telescope as a tool used to see objects far away.	NA

Grade 4

STANDARD 4-4

Standard 4-4: The student will demonstrate an understanding of weather patterns and phenomena. (Earth Science)
Extended Standard: The student will demonstrate an understanding that weather is the state of Earth's atmosphere and is always changing.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-4.1 Summarize the processes of the water cycle (including evaporation, condensation, precipitation, and runoff).	Evaporation occurs when the Sun's energy causes liquid water to become a gas called *water vapor*. *Condensation* occurs when water vapor changes back to droplets of water upon cooling. This process makes clouds and dew. *Precipitation* occurs when the water droplets fall to the ground. If atmospheric temperatures are freezing, water may precipitate as snow, sleet, or hail. Precipitation returns to bodies of water as *runoff*.	Illustrate the movement of water throughout the water cycle.	Identify parts of the water cycle.	Identify clouds, rain, and the Sun as elements in the water cycle.
4-4.2 Classify clouds according to their three basic types (cumulus, cirrus, and stratus) and summarize how clouds form.	*Cumulus* clouds are puffy; they bring rain when they are dark but not when they are white. *Cirrus* clouds are wispy and are associated with fair weather. *Stratus* clouds are spread out and low in the sky.	Predict weather on the basis of observations of clouds.	Classify clouds on the basis of their physical characteristics.	Recognize cumulus clouds.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-4.3 Compare daily and seasonal changes in weather conditions (including wind speed and direction, precipitation, and temperature) and patterns.	Weather may include the following conditions: *Temperature* is how hot or cold the atmosphere is. The temperature changes as the seasons change. *Wind speed* is how fast the wind is blowing. *Wind direction* is where the wind is coming from. *Precipitation* is a form of water falling to Earth. The temperature changes as seasons change.	Compare seasonal weather conditions (e.g., hurricanes in the summer, cold temperatures in winter).	Identify the current precipitation and temperature conditions.	Identify the current precipitation conditions.
4-4.4 Summarize the conditions and effects of severe weather phenomena (including thunderstorms, hurricanes, and tornadoes) and related safety concerns.	*Thunderstorms* have lightning, thunder, heavy rain or hail, and strong winds. *Tornadoes* are funnel-shaped clouds that spin at high speeds. *Hurricanes* form over warm ocean water and have very strong winds that blow in a circular pattern. These storms can cause various types of damage and require certain safety procedures.	Classify the types of severe weather on the basis of given properties.	Recognize safety concerns related to severe weather conditions.	Identify a type of severe weather (e.g., thunderstorm).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-4.5 Carry out the procedures for data collecting and measuring weather conditions (including wind speed and direction, precipitation, and temperature) by using appropriate tools and instruments.	A variety of tools are used for measuring weather conditions. Wind speed is measured with an *anemometer*. Wind direction is measured with a *wind* (weather) *vane*. Precipitation as rain is measured with a *rain gauge*. Temperature is measured with a *thermometer*.	Match tools with the weather condition they measure.	Use tools for measuring precipitation and temperature.	Use tools for measuring precipitation.
4-4.6 Predict weather from data collected through observation and measurements.	Weather maps show large masses of warm or cold air as well as temperature and precipitation.	Use a weather map to predict or describe weather.	Identify a weather map from the media.	NA

Grade 4

STANDARD 4-5

Standard 4-5: The student will demonstrate an understanding of the properties of light and electricity. (Physical Science)
Extended Standard: The student will demonstrate an understanding of some of the properties of light and electricity.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-5.1 Summarize the basic properties of light (including brightness and colors).	The *brightness* of light is related to the amount of light that can be seen. The closer the source of light is, the greater the brightness. White light is made up of all colors and can be separated into different colors. In order for an object to be visible, it must either be a source of light (such as a candle) or it must reflect light.	Compare the sources and brightness of light, and recognize that all the colors in light can be seen in a rainbow.	Compare differences in the brightness of light.	Identify sources of light.
4-5.2 Illustrate the fact that light, as a form of energy, is made up of many different colors.	The different colors of light are revealed when white light is passed through a prism or are seen in a rainbow.	Exemplify the different colors of light by using a prism.	Recognize the different colors of white light that are seen in a rainbow.	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-5.3 Summarize how light travels and explain what happens when it strikes an object (including reflection, refraction, and absorption).	When light is *reflected*, it bounces back from a surface. Light that does not pass through or reflect from a surface is *absorbed*. Light passes through objects that are *transparent* (e.g., glass, air).	Compare the way light behaves when it is reflected with the way it does when it is absorbed.	Recognize that light can be reflected or absorbed.	Recognize that light travels through some materials but not others.
4-5.4 Compare how light behaves when it strikes transparent, translucent, and opaque materials.	Light behaves differently when it strikes different types of materials. *Transparent* materials allow light to pass through them. *Translucent* materials allow only some of the light to pass through, and *opaque* materials do not allow light to pass through—the light is either reflected or absorbed.	Classify types of materials as transparent (e.g., water, air), translucent (e.g., waxed paper), or opaque (e.g., construction paper, wood).	Classify types of materials as transparent or opaque.	Identify transparent materials.
4-5.5 Explain how electricity, as a form of energy, can be transformed into other forms of energy (including light, heat, and sound).	*Electrical* energy can be changed to *light* energy with light bulbs. It can be changed to *heat* energy in stoves and toasters, and it can also be changed to *sound* energy in radios.	Illustrate energy transformations from electricity to heat, light, and sound.	Illustrate ways that electricity can be used.	Identify sources of electricity.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-5.6 Summarize the functions of the components of complete circuits (including wire, switch, battery, and light bulb).	Each component of a complete circuit has a particular function: (a) the *wire* conducts electricity; (b) the *switch* allows electricity to flow if closed and stops electricity if open; (c) the *battery* pushes the electric current around the circuit; (d) the *light bulb* changes the electrical energy to light energy.	Summarize the function of the components of a circuit.	Identify parts of a circuit.	Identify a battery as a source of electricity.
4-5.7 Illustrate the path of electric current in series and parallel circuits.	NA	NA	NA	NA
4-5.8 Classify materials as either conductors or insulators of electricity.	*Conductors* allow electricity to flow through them. *Insulators* do not allow electric current to flow through them in an electric circuit. Metals are conductors. Plastics and wooden materials are examples of insulators.	Predict the result of adding certain materials to circuits.	Classify objects as conductors and insulators.	Identify metal wires as conductors of electricity.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
4-5.9 Summarize the properties of magnets and electromagnets (including polarity, attraction/repulsion, and strength).	The properties of magnets include *polarity* (the magnetic attraction or pull is strongest at the poles), *attraction* or *repulsion* (moving toward or pushing away from), and *strength* (having a greater or lesser attraction for magnetic materials).	Illustrate the properties of magnets.	Exemplify magnetic attraction and repulsion.	Identify a magnet by its attraction to magnetic materials.
4-5.10 Summarize the factors that affect the strength of an electromagnet.	NA	NA	NA`	NA

Grade 5

STANDARD 5-1

Standard 5-1: The student will demonstrate an understanding of scientific inquiry, including the foundations of technological design and the processes, skills, and mathematical thinking necessary to conduct a controlled scientific investigation.

Extended Standard: The student will demonstrate an understanding of scientific inquiry, including the process skills necessary for conducting a simple scientific investigation.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-1.1 Identify questions suitable for generating a hypothesis.	Only *testable questions* are suitable for scientific investigations. A *hypothesis* is a prediction about the relationship between variables formed from a testable question. A controlled investigation must have a hypothesis (i.e., a prediction about the outcome of the investigation).	Identify a testable question that would lead to a scientific investigation.	Identify the hypothesis (prediction of outcome) of a simple experiment.	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-1.2 Identify independent (manipulated), dependent (responding), and controlled variables in an experiment.	The factor being changed in an experiment is called the *manipulated* or *independent* variable. The *dependent*, or *responding*, variable responds to the change and often indicates the results of the experiment. Factors that are kept the same in an experiment are called *controlled variables*.	Recognize the manipulated and responding variables in a simple experiment.	Recognize the results or outcome of a simple experiment as the responding (dependent) variable.	Identify the variable that is being changed in a simple experiment (e.g., if an experiment is conducted to see if bean seeds will sprout without water, the amount of water the bean seeds receive is the manipulated, or changed, variable).
5-1.3 Plan and conduct controlled scientific investigations, manipulating one variable at a time.	In a controlled scientific investigation, only one factor (*variable*) can be manipulated or changed at a time. All other factors must be kept the same (*controlled variables*).	Conduct a simple scientific investigation recognizing the manipulated and controlled variables.	Conduct a simple scientific investigation.	Recognize some of the steps in a controlled investigation.
5-1.4 Use appropriate tools and instruments (including a timing device and a 10x magnifier) safely and accurately when conducting a controlled scientific investigation.	Tools used in conducting a scientific controlled investigation include a timing device and a 10x magnifier. *(These tools are in addition to those introduced in earlier grades. All tools should be used safely and correctly.)*	Use a timing device safely and accurately to determine speed and a 10x magnifier to observe small objects such as cells.	Use a 10x magnifier to observe objects as small as cells (e.g., in an onion leaf).	Use a magnifier to observe small objects or parts of objects.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-1.5 Construct a line graph from recorded data with correct placement of independent (manipulated) and dependent (responding) variables.	NA	NA	NA	NA
5-1.6 Evaluate results of an investigation to formulate a valid conclusion based on evidence and communicate the findings of the evaluation in oral or written form.	A valid conclusion is an explanation that is based on evidence (i.e., observations and data) of the relationship between the manipulated and responding variables.	Formulate a valid conclusion on the basis of evidence from an investigation.	Identify a valid conclusion to an investigation based on observations or data.	Identify a conclusion to a simple investigation based on observations.
5-1.7 Use a simple technological design process to develop a solution or a product, communicating the design by using descriptions, models, and drawings.	NA	NA	NA	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-1.8 Use appropriate safety procedures when conducting investigations.	Important safety procedures in conducting investigations include wearing goggles and aprons, being careful with sharp objects or glass (*only teachers should clean up broken glass*), following all directions, and keeping the workplace neat. (*Hands should be washed after every activity.)*	Use safety procedures in conducting an investigation.	Recognize safety procedures such as washing hands and following directions.	Identify a piece of safety equipment (e.g., goggles, an apron).

Grade 5

STANDARD 5-2

Standard 5-2: The student will demonstrate an understanding of relationships among biotic and abiotic factors within terrestrial and aquatic ecosystems. (Life Science)

Extended Standard: The student will demonstrate an understanding of the relationships among living and nonliving factors in an ecosystem.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-2.1 Recall the cell as the smallest unit of life and identify its major structures (including cell membrane, cytoplasm, nucleus, and vacuole).	The cell is the smallest unit of living material having major structures within it that allow it to live. All organisms are made of cells. Some of the major structures in a cell are cell membrane, nucleus, cytoplasm, and vacuole.	Recognize that organisms are made of cells and that cells have major structures.	Identify a cell and its nucleus.	NA
5-2.2 Summarize the composition of an ecosystem, considering both biotic factors (including populations to the level of microorganisms and communities) and abiotic factors.	Ecosystems consist of the living factors (*biotic*) as well as the nonliving (*abiotic*) factors such as temperature, water, soil, air, and sunlight. The living factors are grouped as *populations* (i.e., all members of one kind of organism that live in the area) and *communities* of organisms (i.e., groups of different populations).	Illustrate an ecosystem, including the living and nonliving factors, populations, and communities within it.	Classify the living and nonliving factors of an ecosystem, and identify populations within that ecosystem.	Identify the living and nonliving factors in an ecosystem.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-2.3 Compare the characteristics of different ecosystems (including estuaries/salt marshes, oceans, lakes and ponds, forests, and grasslands).	*Land* ecosystems include forests and grasslands. They have many different types of plants and animals. *Water* ecosystems include oceans, lakes and ponds, and salt marshes. Water ecosystems also support many different types of plants and animals.	Compare the characteristics of different ecosystems (e.g., salt water ocean, freshwater lakes).	Match ecosystems with a plant or animal that survives there.	Recognize a land and a water ecosystem.
5-2.4 Identify the roles of organisms as they interact and depend on one another through food chains and food webs in an ecosystem, considering producers and consumers (herbivores, carnivores, and omnivores), decomposers (microorganisms, termites, worms, and fungi), predators and prey, and parasites and hosts.	*Producers* are able to use light energy from the Sun to make food. *Consumers* cannot make their own food, so they must eat plants or other animals. *Decomposers* break down dead matter. *Predators* hunt other animals, and *prey* are the animals eaten. A *food chain i*s a series of plants and animals in which each organism is a source of energy for the next.	Identify the roles of organisms in a food chain including producers, consumers, predators, prey, and decomposers.	Identify the roles of organisms in a food chain including producers, consumers, predators, and prey.	Identify which organisms eat plants (e.g., rabbits eat the grass).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-2.5 Explain how limiting factors (including food, water, space, and shelter) affect populations in ecosystems.	An ecosystem has only a certain amount of food, water, space, and shelter to support a certain number of organisms. These resources that keep a population at a certain size are called *limiting factors*. Changes in limiting factors can cause populations to increase or decrease.	Predict the effect of changes to an ecosystem on populations (e.g., What will happen to the animals if the grass does not grow? What will happen to the populations of prey if the numbers of predators decrease?).	Identify the effects on an ecosystem that limiting factors can have (e.g., during a drought, the grass will not survive and the number of grass-eating animals will therefore decrease).	Identify factors that affect populations of organisms.

Grade 5

STANDARD 5-3

Standard 5-3: The student will demonstrate an understanding of features, processes, and changes in Earth's land and oceans. (Earth Science)
Extended Standard: The student will demonstrate an understanding that Earth's surface has many features that can be changed.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-3.1 Explain how natural processes (including weathering, erosion, deposition, landslides, volcanic eruptions, earthquakes, and floods) affect Earth's oceans and land in constructive and destructive ways.	Natural processes affect Earth's oceans and land in both constructive and destructive ways: *Weathering* is the slow process of breaking down rocks by water, plant roots, or ice. *Erosion* is the slow movement of sediments by wind, water, ice, and gravity. *Deposition* is the dropping of sediments by water, wind, or ice. *Landslides* are quick movements of land. *Volcanic eruptions* make mountains by building up cooled lava but can destroy land surface features. *Earthquakes* are quick vibrations of Earth that can be very destructive. *Floods* happen when there is a sudden large amount of water.	Illustrate the relationship between natural processes and their resulting land changes.	Match a natural process with its resulting land changes.	Identify erosion as a natural process that shapes Earth's surface.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-3.2 Illustrate the geologic landforms of the ocean floor (including the continental shelf and slope, the mid-ocean ridge, rift zone, trench, and the ocean basin).	The edges of the continents slope down into the ocean and are called *continental shelves*. A *mid-ocean ridge* is composed of volcanic mountains that divide the ocean floor. The sides of the mid-ocean ridges are *ocean basins*. *Trenches* are canyons in the ocean floor.	Illustrate some of the characteristics of the geologic landforms of the ocean floor.	Identify some of the geologic landforms of the ocean floor.	NA
5-3.3 Compare continental and oceanic landforms.	NA	NA	NA	NA
5-3.4 Explain how waves, currents, tides, and storms affect the geologic features of the ocean shore zone (including beaches, barrier islands, estuaries, and inlets).	The movement of the water in Earth's oceans shapes the geologic features of the ocean shore zone by causing a number of natural processes. (*These processes are listed in indicator 5-3.1*.) The *shoreline* is where the ocean meets land; shorelines made of sand are beaches. *Barrier islands* are sandy islands that protect the mainland from waves. *Inlets* are the water-filled spaces between the barrier islands. *Estuaries* are where a river meets the ocean.	Summarize the features of the shoreline (e.g., ocean meets land, sand beaches).	Identify some of the features of the shoreline (e.g., sand beaches).	Recognize beaches as part of the shoreline.

		Communication Levels		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-3.5 Compare the movement of water by waves, currents, and tides.	NA	NA	NA	NA
5-3.6 Explain how human activity (including conservation efforts and pollution) has affected the land and the oceans of Earth.	Humans can conserve natural resources by reducing, reusing, and recycling. Humans can also harm natural resources by destroying or polluting them.	Compare the effects of conservation and pollution.	Exemplify a human activity that is good or bad for the land and oceans of Earth.	Exemplify conservation efforts by recycling.

Grade 5

STANDARD 5-4

Standard 5-4: The student will demonstrate an understanding of properties of matter. (Physical Science)

Extended Standard: The student will demonstrate an understanding that matter has many properties, can be found in various forms, and can combine to form mixtures or new substances.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-4.1 Recall that matter is made up of particles too small to be seen.	All matter is made up of very small particles that are too small to be seen.	Recognize that tiny particles make up matter.	Identify concrete objects as matter.	NA
5-4.2 Compare the physical properties of the states of matter (including volume, shape, and the movement and spacing of particles).	The states of matter have different physical properties. *Solids* have a definite shape and volume, and the particles are very close to one another. *Liquids* have a definite volume but take the shape of the container. The particles are close but able to move apart and flow from place to place. *Gases* have no definite shape or volume, and the particles spread throughout available space.	Compare solids, liquids, and gases.	Classify solids, liquids, and gases.	Identify solids and liquids.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-4.3 Summarize the characteristics of a mixture, recognizing a solution as a kind of mixture.	*Mixtures* can be made from various combinations of solids, liquids, or gases. The substances in mixtures do not combine permanently and keep their separate properties. *Solutions* are a type of mixture composed of substances that mix so completely that they cannot be distinguished as separate substances (e.g., salt or sugar in water).	Compare mixtures and solutions.	Exemplify various types of mixtures (i.e., solid and solid, solid and liquid, liquid and liquid, and liquid and gas).	Identify mixtures in which the individual materials are identifiable (e.g., salad, sand and water).
5-4.4 Use the processes of filtration, sifting, magnetic attraction, evaporation, chromatography, and floatation to separate mixtures.	*Solids* can be separated from liquids by *filtering*. Solids can be separated from other solids of a different size by *sifting*. *Magnetic attraction* is used to separate magnetic material from other substances. *Evaporation* separates a solid that has dissolved in a liquid. *Floatation* is used to separate solids that float from solids that do not float.	Match the process of separation with type of mixture to be separated.	Exemplify processes that can be used to separate mixtures.	Recognize processes that can be used to separate mixtures (e.g., using filter paper to separate a mixture of sand and water).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-4.5 Explain how the solute and the solvent in a solution determine the concentration.	NA	NA	NA	NA
5-4.6 Explain how temperature change, particle size, and stirring affect the rate of dissolving.	Several factors affect the rate of dissolving: solids will dissolve faster if the temperature increases, if the particles are small, or if the solution is stirred.	Illustrate ways to change the rate of dissolving.	Recognize the factors that affect the rate of dissolving.	Recognize that the rate of dissolving can change (e.g., tea bags in hot water as opposed to cold water).
5-4.7 Illustrate the fact that when some substances are mixed together, they chemically combine to form a new substance that cannot easily be separated.	NA	NA	NA	NA
5-4.8 Explain how the mixing and dissolving of foreign substances is related to the pollution of the water, air, and soil.	NA	NA	NA	NA

Grade 5

STANDARD 5-5

Standard 5-5: The student will demonstrate an understanding of the nature of force and motion. (Physical Science)

Extended Standard: The student will demonstrate an understanding that the motion of an object can be affected by a change in force or a change in mass.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-5.1 Illustrate the affects of force (including magnetism, gravity, and friction) on motion.	*Magnetism* is a force that cannot be seen; it is found in certain materials that are called *magnets*. The closer that magnetic objects are to one another, the greater the magnetic force between them. *Gravity* is the force that attracts objects to each other. Earth's gravity pulls objects toward the center of Earth and makes any object fall to the ground. *Friction* is the force that opposes motion between two surfaces. The effect of friction can be observed as an object slides across a surface and slows down.	Compare the forces of gravity, magnetism, and friction on objects.	Identify gravity, magnetism, and friction as forces that affect objects.	Identify the effects of the force of gravity (i.e., objects falling down) and magnetism.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-5.2 Summarize the motion of an object in terms of position, direction, and speed.	The *position* of an object is its location relative to another point (the *reference point*), and the distance from the reference point changes when the object moves. The *direction* of an object's motion is the course or path it takes—"backward," "forward," "up," "down," and so on. *Speed* of an object is a measure of how fast it is moving.	Compare the motion of two objects in terms of their position, direction, and speed.	Illustrate the motion of an object in terms of its position, direction, and speed.	Identify the speed (fast or slow) or the direction (up or down) of a moving object.
5-5.3 Explain how unbalanced forces affect the rate and direction of motion in objects.	NA	NA	NA	NA
5-5.4 Explain ways to change the effect that friction has on the motion of objects (including changing the texture of the surfaces, changing the amount of surface area involved, and adding lubrication).	Surface texture (e.g., rough as opposed to smooth) and the amount of lubrication are two variables that influence the effect of friction, which is the force that acts against the motion of an object.	Explain ways to reduce the effect that friction has on the motion of an object.	Illustrate the effect that different surfaces can have on the motion of an object.	Illustrate the reduction of friction by lubrication.
5-5.5 Use a graph to illustrate the motion of an object.	NA	NA	NA	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
5-5.6 Explain how a change of force or a change in mass affects the motion of an object.	The motion of an object can be affected by a change in force (push or pull) or a change in mass. When there is a change in mass, a particular force will have a greater effect on the motion of an object with less mass than it will have on an object with greater mass. When there is a change in force, the greater the amount of force applied to an object, the greater the change in the motion of that object.	Predict the change in the motion of an object that will be caused by a change in its mass or force.	Illustrate how a change of force can affect the motion of an object.	Recognize that when the same force (push or pull) is applied to two different objects, the mass (heavy or light) of the objects will affect their motion. (e.g., when the same push is applied to a heavy book and to a light book, the heavy book will move less).

Science Extended Standards

Grade Band 6–8

Grade 6

STANDARD 6-1

Standard 6-1: The student will demonstrate an understanding of technological design and scientific inquiry, including process skills, mathematical thinking, controlled investigative design and analysis, and problem solving.

Extended Standard: The student will demonstrate an understanding of scientific inquiry, including process skills necessary for conducting a controlled scientific investigation.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-1.1 Use appropriate tools and instruments (including a spring scale, beam balance, barometer, and sling psychrometer) safely and accurately when conducting a controlled scientific investigation.	Tools used in conducting a controlled scientific investigation include the spring scale and the beam balance. *(These tools are in addition to those introduced in earlier grades. All tools should be used safely and correctly.)*	Select tools for measuring mass and weight to be used in a controlled scientific investigation.	Match tools with their functions.	Identify a beam balance as a tool for measuring the mass of an object.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-1.2 Differentiate between observation and inference during the analysis and interpretation of data.	Data include both scientific observations and inferences. A *scientific observation* is gained by identifying and describing properties using the five senses or scientific tools. An *inference* is an explanation or interpretation of an observation on the basis of prior experiences or observations made in the investigation. Data from an investigation are organized in data tables and represented as diagrams or graphs.	Compare observations and inferences to differentiate between them. Interpret simple data in diagrams and graphs that show the results of a scientific investigation.	Infer the results of a simple scientific investigation.	Recognize observations made during a scientific investigation.
6-1.3 Classify organisms, objects, and materials according to their physical characteristics by using a dichotomous key.	A *dichotomous key* is a tool used for identifying an organism, object, or material. It is based on a series of paired, mutually exclusive (i.e., *dichotomous)* statements or questions about the organism, object, or material that ultimately leads the reader to make the identification.	Classify organisms and objects by using a dichotomous key.	Classify organisms by using a simple dichotomous key.	NA

Indicator	Essential Knowledge	COMMUNICATION LEVELS		
		Abstract Symbolic	Concrete Symbolic	Pre-Symbolic
6-1.4 Use a technological design process to plan and produce a solution to a problem or a product (including identifying a problem, designing a solution or a product, implementing the design, and evaluating the solution or the product).	Technology applies scientific knowledge in order to develop a solution to a problem or create a product to help meet human needs. Steps in the technological design process include (1) identifying a problem or need, (2) designing a solution or a product, (3) implementing the design, and (4) evaluating the solution or the product.	Evaluate a product of technological design to determine if it solves the problem for which it was created (e.g., a ramp that is too steep will not allow access to a building).	Identify a problem or need that can be solved only through technology.	NA
6-1.5 Use appropriate safety procedures when conducting investigations.	Important safety procedures in conducting investigations include wearing goggles and aprons, being careful with sharp objects or glass (*only teachers should clean up broken glass*), following all directions, and keeping the workplace neat. (*Hands should be washed after every activity*.)	Use safety procedures in conducting an investigation. .	Recognize safety procedures such as washing hands or following directions.	Identify a piece of safety equipment (e.g., goggles, an apron).

Grade 6

STANDARD 6-2

Standard 6-2: The student will demonstrate an understanding of structures, processes, and responses of plants that allow them to survive and reproduce. (Life Science)

Extended Standard: The student will demonstrate an understanding of structures, processes, and responses of plants that allow them to survive.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-2.1 Summarize the characteristics that all organisms share (including the obtainment and use of resources for energy, the response to stimuli, the ability to reproduce, and process of physical growth and development).	Living organisms obtain and use resources such as food, oxygen, and water, which provide energy for life's processes. Living things also respond to stimuli, reproduce, grow, and develop.	Summarize the characteristics that all organisms share (e.g., responding to stimuli, producing offspring, using food for energy).	Identify some of the characteristics of organisms (e.g., obtaining food and water, growing).	Recognize that living things need food and water and will grow.
6-2.2 Recognize the hierarchical structure of the classification (taxonomy) of organisms (including the seven major levels or categories of living things—namely, kingdom, phylum, class, order, family, genus, and species).	Organisms are classified on a hierarchical structure. The plant and animal kingdoms contain most of Earth's species. A *species* consists of all the organisms of the same type (e.g., oak trees, black bears, monarch butterflies).	Identify common species in the plant and animal kingdoms.	Recognize a species as organisms of the same type.	Identify organisms as either plants or animals.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-2.3 Compare the characteristic structures of various groups of plants (including vascular or nonvascular, seed or spore-producing, flowering or cone-bearing, and monocot or dicot).	Organisms in the plant kingdom are classified into groups on the basis of their specific structures (e.g., whether they produce flowers or cones).	Summarize the characteristic structures (seeds, flowers, and cones) of plants.	Classify plants as having flowers or cones.	Recognize that some plants produce flowers and others do not.
6-2.4 Summarize the basic functions of the structures of a flowering plant for defense, survival, and reproduction.	Plants have structures for defense, survival, and reproduction. Structures for defense may include thorns and poisonous leaves. Structures for survival in their habitats may include leaves for photosynthesis, stems for support, and roots for anchoring them and absorbing water and nutrients. Structures for reproduction include seeds and flowers.	Relate a plant's structures to its survival (e.g., the stem supports the plant and also transports water from the roots to the leaves).	Classify the structures of a plant and their functions (e.g., leaves make food, stems provide support).	Identify the structures (leaf, stem, root, flowers) of plants.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-2.5 Summarize each process in the life cycle of flowering plants (including germination, plant development, fertilization, and seed production).	All flowering plants have life cycles that include distinct stages: (1) *germination*—dispersed seeds begin to grow; (2) *plant development*—seedlings grow into mature plants; (3) *fertilization*—pollen is produced and transferred to the pistil of a flower; (4) *seed production*—the fertilized flower produces a seed, which is often protected by a fruit.	Summarize the events occurring at each of the life cycle stages of flowering plants.	Identify the life stages of a flowering plant.	Identify a seed, a plant, a flower, and a fruit.
6-2.6 Differentiate between the processes of sexual and asexual reproduction of flowering plants.	*Pollination* is the method of sexual reproduction in flowering plants. It requires male and female parts (pistil and stamen), which produce a seed (new organism). Many plants can produce offspring asexually (i.e., with only one parent plant or plant part).	Compare the processes of sexual and asexual reproduction in flowering plants (e.g., pollination as opposed to the production of a new plant from a part of a parent plant).	Match the method of reproduction, *sexual* or *asexual*, with specific examples (e.g., flowers producing seeds, tubers or plant cuttings producing new plants).	Recognize plant reproduction requiring only plant parts, such as tubers (e.g., potatoes) or leaves (e.g., African violets).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-2.7 Summarize the processes required for plant survival (including photosynthesis, respiration, and transpiration).	The processes necessary for plant survival include *photosynthesis* (making of food), *respiration* (providing the plant with energy), and *transpiration* (water loss through evaporation in the leaves).	Explain why the processes of photosynthesis and respiration (getting energy for growth) are necessary for plant survival.	Identify the components of photosynthesis: light (Sun or artificial), water and air (for oxygen) are necessary for plant survival.	Recognize that light and water are necessary for green plant survival (for photosynthesis).
6-2.8 Explain how plants respond to external stimuli (including dormancy and the forms of tropism known as phototropism, gravitropism, hydrotropism, and thigmotropism).	Plants respond to changes in their environments by growing their stems, roots, or leaves toward or away from the stimulus.	Summarize ways that plants respond to the factors in their environment (e.g., light, water, gravity).	Recognize that plants grow toward light, roots grow down, and stems grow up.	Recognize that plants grow toward light.
6-2.9 Explain how disease-causing fungi can affect plants.	NA	NA	NA	NA

Grade 6

STANDARD 6-3

Standard 6-3: The student will demonstrate an understanding of structures, processes, and responses of animals that allow them to survive and reproduce. (Life Science)

Extended Standard: The student will demonstrate an understanding that animals have special structures and behavioral characteristics that allow them to survive and respond to their environments.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-3.1 Compare the characteristic structures of invertebrate animals (including sponges, segmented worms, echinoderms, mollusks, and arthropods) and vertebrate animals (fish, amphibians, reptiles, birds, and mammals).	Aminals can be classified into two major groups. *Vertebrates* have backbones, internal skeletons, muscles, blood, and a nervous system with a brain. *Invertebrates* do not have backbones or internal skeletons.	Classify animals as vertebrates and invertebrates on the basis of their characteristic structures.	Identify insects, worms, or spiders as invertebrates and humans as vertebrates (having a backbone).	Identify insects as invertebrates (i.e., no internal backbone).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-3.2 Summarize the basic functions of the structures of animals that allow them to defend themselves, to move, and to obtain resources.	Animals have structures that enable them to survive in their environment. Structures for *defense* may include skin color for camouflage or horns or claws for attacking another animal. Structures for *movement* allow animals to find food and escape predators. Structures for *obtaining resources* allow an animal to hold or consume its food.	Classify the structures of animals on the basis of their function (e.g., feet and legs for movement, claws and horns for defense).	Match the structures of animals with their function (e.g., legs and muscles for movement, teeth and beaks for obtaining resources).	Identify the structures of animals that allow them to move (e.g., legs, wings) or to obtain resources (e.g., beaks, teeth, pincers, claws).
6-3.3 Compare the response that a warm-blooded (endothermic) animal makes to a fluctuation in environmental temperature with the response that a cold-blooded (ectothermic) animal makes to such a fluctuation.	NA	NA	NA	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-3.4 Explain how environmental stimuli cause physical responses in animals (including shedding, blinking, shivering, sweating, panting, and food gathering).	Animals respond to environmental stimuli. Animals may grow or shed fur or feathers to insulate or cool their bodies. Animals may sweat or pant to get rid of excess body heat. Shivering increases heat production and is a response to a drop in temperature. Animals also blink to protect their eyes.	Explain an animal's physical response to environmental stimuli (e.g., shedding, sweating, panting, shivering).	Match environmental stimuli to a physical response in animals (e.g., hot, sunny day and picture of a dog panting; cold, wintry day and picture of an animal shivering).	Identify a physical response, such as blinking or shivering, in animals.
6-3.5 Illustrate animal behavioral responses (including hibernation, migration, defense, and courtship) to environmental stimuli.	Behavioral responses help animals cope with changes in their environments. Among such responses are (a) *hibernation*—becoming dormant or inactive during winter; (b) *migration*—moving from one place to another during seasonal changes; (c) *defense*—using behaviors such as camouflage, offensive odors, or stingers; (d) *mimicry*—copying the behavior of a stronger animal; (e) *grouping*—traveling in herds (e.g., cattle), packs (e.g., wolves),	Illustrate the behavioral responses of animals (e.g., hibernation, migration, defensive behavior) to environmental stimuli (e.g., cold temperatures, lack of food, threats from other animals).	Match a behavioral response to environmental stimuli (e.g., bear hibernating in winter).	NA

Indicator	Essential Knowledge	Communication Levels		
		Abstract Symbolic	Concrete Symbolic	Pre-Symbolic
	or schools (e.g., fish).			
6-3.6 Summarize how the internal stimuli (including hunger, thirst, and sleep) of animals ensure their survival.	Animals have internal stimuli or cues that ensure their survival. Hunger, thirst, and sleepiness cue animals to eat, drink, and sleep.	Classify an animal's response to internal cues on the basis of its needs for survival.	Match an animal's internal cues with its behavioral responses (e.g., thirst prompts an animal to drink water).	Identify an animal's response to hunger or thirst.
6-3.7 Compare learned to inherited behaviors in animals.	Some animal behavior is learned from direct observations or experiences (such as a dog learning to sit on command) and some is inherited (instinct), such as baby animals crying for food.	Compare learned and inherited behaviors in animals (e.g., whales learning to hunt prey as opposed to whales swimming).	Identify an inherited behavior (e.g., a bird building a nest, a fish swimming).	NA

Grade 6

STANDARD 6-4

Standard 6-4: The student will demonstrate an understanding of the relationship between Earth's atmospheric properties and processes and its weather and climate. (Earth Science)

Extended Standard: The student will demonstrate an understanding of the relationship between the processes (water cycle, winds, temperature) occurring in Earth's atmosphere and its weather.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-4.1 Compare the composition and structure of Earth's atmospheric layers (including the gases and differences in temperature and pressure within the layers).	NA	NA	NA	NA
6-4.2 Summarize the interrelationships among the dynamic processes of the water cycle (including precipitation, evaporation, transpiration, condensation, surface-water flow, and groundwater flow).	Water continually moves between Earth's atmosphere and its surface. Water enters the atmosphere through evaporation. Condensation of water forms clouds and results in precipitation. When precipitation falls on land, it will result in run off or ground water.	Summarize the processes of the water cycle (e.g., follow a drop of water through the cycle).	Illustrate the sequence of the processes in the water cycle (e.g., evaporation, condensation, precipitation).	Identify an example of precipitation (e.g., rain, snow).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-4.3 Classify shapes and types of clouds according to elevation and their associated weather conditions and patterns.	Clouds can be classified into three major groups. *Cumulus* clouds are puffy and bring rain when they are dark but do not bring rain when they are white. *Cirrus* clouds are wispy and are associated with fair weather. *Stratus* clouds are spread out and may bring precipitation. Clouds that form near the ground are called *fog*.	Predict weather conditions on the basis of cloud formations.	Match clouds with weather conditions.	Identify clouds that will most likely produce rain (e.g., dark as opposed to white and fluffy).
6-4.4 Summarize the relationship of the movement of air masses, high and low pressure systems, and frontal boundaries to storms (including thunderstorms, hurricanes, and tornadoes) and other weather conditions.	NA	NA	NA	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-4.5 Use appropriate instruments and tools to collect weather data (including wind speed and direction, air temperature, humidity, and air pressure).	An *anemometer* measures wind speed in miles per hour. A *wind vane* indicates wind direction. A *thermometer* measures air temperature. A *barometer* measures air pressure. Precipitation as rain is measured with a *rain gauge.*	Use appropriate instruments to collect weather data.	Match instruments with the weather data they collect.	Use a rain gauge to measure rainfall or a thermometer to measure air temperature.
6-4.6 Predict weather conditions and patterns based on weather data collected from direct observations and measurements, weather maps, satellites, and radar.	Weather conditions can be observed or measured. Weather data includes cloud types and coverage, precipitation conditions, storm locations, and air temperature.	Predict weather conditions on the basis of data (e.g., cloud conditions, air temperature.).	Interpret simple data to identify current weather conditions.	Identify weather conditions (e.g., hot or cold, wet or dry).
6-4.7 Explain how solar energy affects Earth's atmosphere and surface (land and water).	The Sun provides the solar energy that drives circulation in Earth's atmosphere. Solar energy is absorbed by Earth and is changed to heat that becomes trapped in the atmosphere. This trapping of heat is known as the *greenhouse effect.*	Predict effects of solar energy on land and water.	Identify effects of solar energy on land.	Identify the Sun as a heat and light source for Earth.
6-4.8 Explain how convection affects weather	NA	NA	NA	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
patterns and climate.				
6-4.9 Explain the influence of global winds and the jet stream on weather and climatic conditions.	NA	NA	NA	NA

Grade 6

STANDARD 6-5

Standard 6-5: The student will demonstrate an understanding of the law of conservation of energy and the properties of energy and work. (Physical Science)

Extended Standard: The student will demonstrate energy is conserved, exists in different types and forms, and has properties as well as the ability to transform and enable something to do work.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-5.1 Identify the sources and properties of heat, solar, chemical, mechanical, and electrical energy.	As *heat* energy is added to a substance, the temperature goes up. The Sun, electricity, and burning wood are sources of heat. *Solar* energy is energy from the Sun. *Chemical* energy is stored in particles of matter such as batteries or food. *Electrical* energy is energy flowing in a circuit; its sources include batteries and generators. *Mechanical* energy is due to the motion and position of an object.	Recognize sources of heat (e.g., rubbing things together), solar energy (the Sun), chemical energy (e.g., batteries), electrical energy (e.g., circuits), or mechanical energy (e.g., a fan, a moving car).	Identify sources of heat and solar or electrical energy.	Identify a battery as a source of energy.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-5.2 Explain how energy can be transformed from one form to another (including the two types of mechanical energy, potential and kinetic, as well as chemical and electrical energy) in accordance with the law of conservation of energy.	NA	NA	NA	NA
6-5.3 Explain how magnetism and electricity are interrelated by using descriptions, models, and diagrams of electromagnets, generators, and simple electrical motors.	NA	NA	NA	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-5.4 Illustrate energy transformations (including the production of light, sound, heat, and mechanical motion) in electrical circuits.	An electric circuit contains a source of electrical energy and a conductor connected to the energy source. *Electrical* energy can be transformed into light energy in an electric circuit if a light bulb is added. It can be transformed into *sound* energy if a bell, buzzer, or radio is added. It can be transformed into *heat* energy if a toaster or heater is added. It can be transformed into *mechanical energy* if a fan or motor is added.	Illustrate energy transformations within a circuit.	Identify transformations of energy (e.g., electrical to mechanical [fan], electrical to light [lamp]).	NA
6-5.5 Illustrate the directional transfer of heat energy through convection, radiation, and conduction.	*Conduction* is the transfer of heat energy involving objects in direct contact. *Insulators* are poor conductors of heat.	Compare the transfer of heat through the process of conduction by objects that are conductors as opposed to objects that are insulators.	Exemplify heat transfer by conduction (e.g., hot water and metal spoon, heating pad and towel.).	NA
6-5.6 Recognize that energy is the ability to do work (force exerted over a distance).	NA	NA	NA	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
6-5.7 Explain how the design of simple machines (including levers, pulleys, and inclined planes) helps reduce the amount of force required to do work.	A *lever* is a bar or board designed to reduce the amount of force required to lift weight. A *pulley* has a grooved wheel with a rope running along the groove, which changes the amount and/or direction of the effort force applied. An *inclined plane* is a sloping surface that reduces the amount of force required to lift or move an object.	Match a simple machine to its task.	Identify a simple machine.	NA
6-5.8 Illustrate ways that simple machines exist in common tools and in complex machines.	(See indicator 6-5.7.)	(See indicator 6-5.7.)	(See indicator 6-5.7.)	(See indicator 6-5.7.)

Grade 7

STANDARD 7-1

Standard 7-1: The student will demonstrate an understanding of technological design and scientific inquiry, including process skills, mathematical thinking, controlled investigative design and analysis, and problem solving.

Extended Standard: The student will demonstrate an understanding of scientific inquiry including process skills necessary for conducting a controlled scientific investigation.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-1.1 Use appropriate tools and instruments (including a microscope) safely and accurately when conducting a controlled scientific investigation.	Tools used in conducting a scientific investigation include the microscope. *(This tool is in addition to those introduced in earlier grades. All tools should be used safely and correctly.)*	Use a microscope to observe cells and other small objects.	Recognize a microscope and its function to magnify the features of an object.	Identify a microscope.
7-1.2 Generate questions that can be answered through scientific investigation.	Only testable questions can be answered through a scientific investigation and data collection. The question must include the relationship between the manipulated (*independent*) variable and the responding (*dependent*) variable.	Generate a testable question that could be answered through a simple scientific investigation.	Identify a question that could be investigated in a simple experiment.	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-1.3 Explain the reasons for testing one independent variable at a time in a controlled scientific investigation.	A controlled scientific investigation can determine the effect of changing only one variable at a time (*fair test*) while keeping all other variables constant (*controlled*).	Illustrate the variables in an investigation.	Identify the variables in an investigation.	Recognize a factor that changes (manipulated or independent variable) in a simple investigation.
7-1.4 Explain the importance that repeated trials and a well-chosen sample size have with regard to the validity of a controlled scientific investigation.	NA	NA	NA	NA
7-1.5 Explain the relationships between independent and dependent variables in a controlled scientific investigation through the use of appropriate graphs, tables, and charts.	The relationship between the manipulated variable and the responding variables can be interpreted through the use of appropriate graphs, tables, and charts.	Interpret the data on graphs, tables, or charts to determine the relationship between the variables.	Interpret the data on a simple bar graph to determine the relationship between the variables.	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-1.6 Critique a conclusion drawn from a scientific investigation.	Once the results of an investigation are collected and recorded, the data are examined for direct relationships between the variables. The results of the investigation are then compared with the hypothesis, and a valid conclusion can then be made.	Evaluate a conclusion to an investigation on the basis of observations and data.	Compare a conclusion and a given hypothesis (or prediction).	Recognize the results or outcome from a simple investigation.
7-1.7 Use appropriate safety procedures when conducting investigations.	Important safety procedures in conducting investigations include wearing goggles and aprons, being careful with sharp objects or glass (*only teachers should clean up broken glass*), following all directions, and keeping the workplace neat. (*Hands should be washed after every activity*.)	Use safety procedures in conducting an investigation.	Recognize safety procedures such as washing hands or following directions.	Identify a piece of safety equipment (e.g., goggles, an apron).

Grade 7

STANDARD 7-2

Standard 7-2: The student will demonstrate an understanding of the structure and function of cells, cellular reproduction, and heredity. (Life Science)

Extended Standard: The student will demonstrate an understanding of the structures of cells and heredity (genetic influences).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-2.1 Summarize the structures and functions of the major components of plant and animal cells (including the cell wall, the cell membrane, the nucleus, chloroplasts, mitochondria, and vacuoles).	A cell is the smallest unit of life that conducts all life functions. It is usually too small to be seen without a microscope. Cells contain even smaller structures that have different functions.	Illustrate parts of cells (nucleus, cell membrane, cell wall, vacuoles).	Identify parts of cells (nucleus, cell membrane).	Identify cells.
7-2.2 Compare the major components of plant and animal cells.	There are differences between plant cells and animal cells. Plant cells have a cell wall and chloroplasts in which photosynthesis takes place. Plant cells also have large vacuoles (for storage). Structures common to both plant and animal cells are the nucleus, cell membrane, and vacuoles.	Compare plant and animal cells (similarities and differences).	Identify parts of a cell common to both plant and animal cells (nucleus, cell membrane, vacuole).	Compare the shapes of animal cells (round) and plant cells (rectangular).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-2.3 Compare the body shapes of bacteria (spiral, coccus, and bacillus) and the body structures that protists (euglena, paramecium, amoeba) use for food gathering and locomotion.	NA	NA	NA	NA
7-2.4 Explain how cellular processes (including respiration, photosynthesis in plants, mitosis, and waste elimination) are essential to the survival of the organism.	Cellular processes include *photosynthesis*, by which green plants make their own food. *Respiration* is the process that provides all organisms—both plants and animals—with energy for growth and daily activities.	Explain why the processes of photosynthesis (in plants) and respiration (in both plants and animals) are necessary for the survival of the organism.	Recognize the importance of photosynthesis to a plant's survival and predict what would happen to a plant without light, water, or air.	Recognize that green plants produce their own food (photosynthesis).
7-2.5 Summarize how genetic information is passed from parent to offspring by using the terms genes, chromosomes, inherited traits, genotype, phenotype, dominant traits, and recessive traits.	Genetic information (DNA) is passed from parent to offspring, which is why traits in the offspring resemble the traits in the parents: they are inherited. Traits may be *dominant* (always expressed in the offspring) or *recessive* (not expressed in the presence of a dominant trait).	Summarize that offspring have traits that are similar to those of their parents through heredity—that is, genetic information that is passed through genes made of DNA from parent to offspring (e.g., two parent plants with purple flowers will have offspring with purple flowers, two animal parents with blue eyes will have offspring with blue eyes).	Compare the traits of parents with those of their offspring(e.g., fur color, flower shape, hair type).	Match traits of offspring with those of their parents.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-2.6 Use Punnett squares to predict inherited monohybrid traits.	NA	NA	NA	NA
7-2.7 Distinguish between inherited traits and those acquired from environmental factors.	An inherited trait—such as eye color or flower color—is one that is genetically determined. Inherited traits may be dominant or recessive. Environmental factors (e.g., temperature, nutrients, exposure to sunlight, living conditions) can also affect an organism's structure and traits.	Classify traits as inherited or acquired through environmental factors.	Identify traits that are inherited or changed by the environment.	Identify an inherited trait.

Grade 7

STANDARD 7-3

Standard 7-3: The student will demonstrate an understanding of the functions and interconnections of the major human body systems, including the breakdown in structure or function that disease causes. (Life Science)

Extended Standard: The student will demonstrate an understanding of the functions of the major body systems and the ways that they can be affected by disease.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-3.1 Summarize the levels of structural organization within the human body (including cells, tissues, organs, and systems).	The human body is organized into different levels: cells, tissues, organs, and systems. *Cells* are the basic units of structure and include nerve, blood, and muscle cells. Cells work together to form tissues. *Organs* are made of tissues that work together to perform a specific function. A group of organs working together forms an *organ system*.	Illustrate how major body organs are organized into organ systems (e.g., heart and blood vessels are part of the circulatory system, stomach and mouth are part of the digestive system).	Identify major tissues that are found in the organs of the human body (e.g., blood and muscle tissue are found in the heart, nerve tissue is in the brain).	Identify tissues such as muscle, bone, or blood in the human body

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-3.2 Recall the major organs of the human body and their function within their particular body system.	The human body is organized into major organ systems. The *circulatory* system includes the heart, which pumps blood throughout the body. The *respiratory* system includes the lungs, which allow us to breathe. The *digestive* system includes the stomach and intestines, which allow us to digest food. The *nervous* system includes the brain, which controls thoughts, voluntary actions, and the sensations related to the five senses. The *muscular*-skeletal system is responsible for movement and protection.	Identify several major organ systems, the major organs within the system, and their functions.	Identify several major organs and their functions (e.g., the heart pumps blood through the body, the stomach digests food).	Identify major organs in the human body.
7-3.3 Summarize the relationships of the major body systems (including the circulatory, respiratory, digestive, excretory, nervous, muscular, and skeletal systems).	NA	NA	NA	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-3.4 Explain the effects of disease on the major organs and body systems (including infectious diseases such as colds and flu, AIDS, and athlete's foot and noninfectious diseases such as diabetes, Parkinson's, and skin cancer).	A *disease* is a condition that prevents the body from functioning normally**.** *Infectious* diseases (e.g., strep throat, cold, flu) are caused by bacteria and viruses. They can be spread by other people, contaminated objects, animal bites, and other factors in the environment. *Noninfectious* diseases (e.g., diabetes, skin cancer, asthma) are not spread from organism to organism. They are malfunctions that can be inherited or caused by environmental factors.	Classify and compare infectious and noninfectious diseases.	Identify the causes and effects of diseases.	Identify a common infectious disease, the effect it has on the body, and ways that it can be spread.

Grade 7

STANDARD 7-4

Standard 7-4: The student will demonstrate an understanding of how organisms interact with and respond to the biotic and abiotic components of their environment. (Earth Science, Life Science)

Extended Standard: The student will demonstrate an understanding of how organisms interact with and respond to the biotic (living) and abiotic (nonliving) components of their environment.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-4.1 Summarize the characteristics of the levels of organization within ecosystems (including populations, communities, habitats, niches, and biomes).	The levels of organization of the living world include the individual organism, populations (groups of the same organisms), communities (groups of populations), and ecosystems (both the biotic and abiotic factors in an environment).	Illustrate the populations, communities, and abiotic factors (water, soil, and temperature) in an ecosystem.	Identify the populations in a community.	Identify a population of organisms (e.g., daisies in a field, gray squirrels in the woods).

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-4.2 Illustrate energy flow in food chains, food webs, and energy pyramids.	Food chains and food webs are sequential diagrams of plants and animals in which each organism is a source of energy for the next organism. Plants (producers) start most food chains. Energy flows from producers to consumers. In food chains and webs, the flow of energy is indicated by arrows going from producers to consumers. For example, a simple food chain can be as follows: grass ➔ rabbit ➔ fox..	Illustrate the energy flow in a simple food web.	Illustrate energy flow in a simple food chain.	Recognize a simple food chain that includes a producer (e.g., grass) and a consumer (e.g., cow).
7-4.3 Explain the interaction among changes in the environment due to natural hazards (including landslides, wildfires, and floods), changes in populations, and limiting factors (including climate and the availability of food and water, space, and shelter).	Changes in the environment can occur due to natural hazards (landslides, wildfires, and floods), changes in populations (increases and decreases), and limiting factors (availability of food, water, space, and shelter).	Explain various ways that natural hazards, changes in populations, or limiting factors affect the environment (e.g., floods destroy shelter, population growth can result in food shortages).	Match the change in the environment with its effect. (e.g., too many fish in a pond limits space and food, wild fires destroy the food and shelter for the deer).	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-4.4 Explain the effects of soil quality on the characteristics of an ecosystem.	Soil is one of the most valuable abiotic factors in an ecosystem. Soil affects the type of plants that can grow and therefore affects other organisms that can survive there.	Compare types of soil (e.g., humus, sand, clay) and the plants that grow in them.	Identify which soil is best for growing plants.	NA
7-4.5 Summarize how the location and movement of water on Earth's surface through groundwater zones and surface-water drainage basins, called watersheds, are important to ecosystems and to human activities.	NA	NA	NA	NA
7-4.6 Classify resources as renewable or nonrenewable and explain the implications of their depletion and the importance of conservation.	*Renewable resources* include air, water from the water cycle, topsoil, trees, animals, sunlight. *Nonrenewable resources* include fossil fuels, metals, and other minerals. People can conserve natural resources by reducing, reusing, recycling, and protecting them.	Explain why resources are renewable or nonrenewable and give examples.	Identify renewable resources.	Identify recyclable items and sort them by the type of material (plastic, aluminum, or paper).

Grade 7

STANDARD 7-5

Standard 7-5: The student will demonstrate an understanding of the classifications and properties of matter and the changes that matter undergoes. (Physical Science)

Extended Standard: The student will demonstrate an understanding that matter undergoes physical and chemical changes and can be classified on the basis of its composition and properties.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-5.1 Recognize that matter is composed of extremely small particles called atoms.	NA	NA	NA	NA
7-5.2 Classify matter as element, compound, or mixture on the basis of its composition.	*Mixtures* are composed of two or more different substances.	Compare mixtures with substances that are not mixtures.	Exemplify mixtures: solid and solid (e.g., salt and pepper), liquid and liquid (e.g., chocolate syrup and milk), and solid and liquid (e.g., sugar and water).	Recognize a mixture as being composed of several different substances (e.g., a tossed salad).
7-5.3 Compare the physical properties of metals and nonmetals.	Metals have physical properties such as luster (shiny surface), heat conduction, and density (heaviness).	Classify objects as metals or nonmetals on the basis of their properties.	Identify objects as metals or nonmetals on the basis of their properties.	Recognize an object as being made of metal (e.g., spoon, key).
7-5.4 Use the periodic table to identify the basic organization of elements and groups of elements (including metals, nonmetals, and families).	NA	NA	NA	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-5.5 Translate chemical symbols and the chemical formulas of common substances to show the component parts of the substances (including NaCl [table salt], H_2O [water], $C_6H_{12}O_6$ [simple sugar], O_2 [oxygen gas], CO_2 [carbon dioxide], and N_2 [nitrogen gas]).	NA	NA	NA	NA
7-5.6 Distinguish between acids and bases and use indicators (including litmus paper, pH paper, and phenolphthalein) to determine their relative pH.	NA	NA	NA	NA
7-5.7 Identify the reactants and products in chemical equations.	NA	NA	NA	NA
7-5.8 Explain how a balanced chemical equation supports the law of conservation of matter.	NA	NA	NA	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
7-5.9 Compare physical properties of matter (including melting or boiling point, density, and color) to the chemical property of reactivity with a certain substance (including the ability to burn or to rust).	NA	NA	NA	NA
7-5.10 Compare physical changes (including changes in size, shape, and state) to chemical changes that are the result of chemical reactions (including changes in color or temperature and formation of a precipitate or gas).	Physical changes include a change in the state of matter, size, or shape.	Exemplify a physical change (e.g., ice melting, water freezing, paper torn into small pieces).	Exemplify a physical change (e.g., ice melting, water freezing, paper torn into small pieces).	Recognize a physical change (e.g., an alteration in the shape or size of a piece of clay).

Grade 8

STANDARD 8-1

Standard 8-1: The student will demonstrate an understanding of technological design and scientific inquiry, including process skills, mathematical thinking, controlled investigative design and analysis, and problem solving.

Extended Standard: The student will demonstrate an understanding of scientific inquiry including process skills necessary for conducting a controlled scientific investigation.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-1.1 Design a controlled scientific investigation.	A controlled scientific investigation includes the following steps: 1. Identify a question. 2. State a prediction that answers the question. 3. Design an experiment by listing materials and procedures. 4. Record and organize the data. 5. Study the data in tables, charts, or graphs. 6. Explain the results. 7. Compare the results with your prediction.	Plan to carry out the steps of a simple controlled scientific investigation.	Summarize some of the steps in a controlled scientific investigation.	Plan and conduct a simple scientific investigation.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-1.2 Recognize the importance of a systematic process for safely and accurately conducting investigations. *(This indicator subsumes 8-1.7.)*	Important safety procedures in conducting investigations include wearing goggles and aprons, being careful with sharp objects or glass (*only teachers should clean up broken glass*), following all directions, and keeping the workplace neat. (*Hands should be washed after every activity.*)	Use safety procedures in conducting an investigation.	Recognize safety procedures such as washing hands or following directions.	Identify a piece of safety equipment (e.g., goggles, an apron).
8-1.3 Construct explanations and conclusions from interpretations of data obtained during a controlled scientific investigation.	Once the results of an investigation are collected and recorded (in graphs, tables, or charts) the data are interpreted and conclusions are drawn from the data analysis.	Interpret data from a scientific investigation to draw conclusions about the investigation.	Identify the responding variable (i.e., the results of the experiment) of a scientific investigation and draw a conclusion from the data.	Recognize a result (responding/dependent variable) of a simple scientific investigation.
8-1.4 Generate questions for further study on the basis of prior investigations.	When the conclusion of an investigation is communicated, others can evaluate the results. The results from one experiment may lead to questions to be investigated in another investigation. The sharing of ideas, thoughts, and questions is part of the nature of science.	Generate a question for an investigation on the basis of the results of a prior investigation.	Identify possible questions to be used for future investigations on the basis of a prior investigation.	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-1.5 Explain the importance of and requirements for replication of scientific investigations.	NA	NA	NA	NA
8-1.6 Use appropriate tools and instruments (including convex lenses, plane mirrors, color filters, prisms, and slinky springs) safely and accurately when conducting a controlled scientific investigation.	Tools used in conducting a controlled scientific investigation include slinky springs. *(These tools are in addition to those introduced in earlier grades—in particular, the tools used in the study of force and motion in grades 5 and 6. All tools should be used safely and correctly.)*	Use appropriate tools for conducting an investigation safely and correctly.	Use appropriate tools for conducting an investigation safely.	Identify a tool used in an investigation.
8-1.7 Use appropriate safety procedures when conducting investigations.	(See indicator 8-1.2.)	(See indicator 8-1.2.)	(See indicator 8-1.2.)	(See indicator 8-1.2.)

Grade 8

STANDARD 8-2

Standard 8-2: The student will demonstrate an understanding of Earth's biological diversity over time. (Life Science, Earth Science)
Extended Standard: The student will demonstrate an understanding of Earth's biological diversity over time.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-2.1 Explain how biological adaptations of populations enhance their survival in a particular environment.	An *adaptation* is a trait or behavior that helps an organism survive. An organism better adapted to a particular environment will survive and produce offspring with the same traits (*natural selection*).	Compare adaptations of different organisms that allow them to survive in a particular environment (e.g., an owl has large eyes for hunting for food in the forest at night).	Match an organism's adaptation with a particular environment for which it is well-adapted (e.g., a cactus plant can store water in its stem, an adaptation that enables it to survive in the desert).	Identify adaptations that help organisms survive in a particular environment.
8-2.2 Summarize how scientists study Earth's past environment and diverse life-forms by examining different types of fossils (including molds, casts, petrified fossils, preserved and carbonized remains of plants and animals, and trace fossils).	A *fossil* is the preserved remains, or traces, of an organism that lived a long, long time ago. Fossils give clues to the diversity of living things.	Infer the past environmental conditions by examining fossils (e.g., a clam fossil indicates that a sea or ocean existed in that place at one time).	Match modern-day organisms with their corresponding fossils (e.g., a picture of a dinosaur with a lizard, a shell fossil with a recent shell).	Recognize a fossil.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-2.3 Explain how Earth's history has been influenced by catastrophes (including the impact of an asteroid or comet, climatic changes, and volcanic activity) that have affected the conditions on Earth and the diversity of its life-forms.	A *catastrophe* is an event that can have global repercussions and cause changes in life forms. Asteroid impact, climate changes, and volcanic activity have changed the environment and the types of organisms that can survive there.	Predict the effect of a catastrophe on an ecosystem.	Identify a catastrophic event and its effect on Earth.	Identify a catastrophe that can affect an ecosystem.
8-2.4 Recognize the relationship among the units—era, epoch, and period—into which the geologic time scale is divided.	NA	NA	NA	NA
8-2.5 Illustrate the vast diversity of life that has been present on Earth over time by using the geologic time scale.	NA	NA	NA	NA
8-2.6 Infer the relative age of rocks and fossils from index fossils and the ordering of the rock layers.	NA	NA	NA	NA

		Communication Levels		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-2.7 Summarize the factors, both natural and man-made, that can contribute to the extinction of a species.	Natural factors (such as volcanic eruptions, climate change, and asteroid impact) and man-made factors (such as clearing rainforests and pollution) have caused extinctions. Some extinctions clear the way for new kinds of life.	Explain how natural or man-made factors have led to extinctions.	Identify natural factors that cause extinctions.	Identify some organisms that are now extinct (e.g., dinosaurs).

Grade 8

STANDARD 8-3

Standard 8-3: The student will demonstrate an understanding of materials that determine the structure of Earth and the processes that have altered this structure. (Earth Science)

Extended Standard: The student will demonstrate an understanding that Earth has many features and is composed of different materials that are constantly changing.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-3.1 Summarize the three layers of Earth—crust, mantle, and core—on the basis of relative position, density, and composition.	Earth's *crust*, its outermost layer, is composed of solid rock. The *mantle* is the middle layer. The *core* is the innermost layer.	Illustrate the layers of Earth.	Identify the crust of Earth as the outermost layer upon which we live.	NA
8-3.2 Explain how scientists use seismic waves—primary, secondary, and surface waves—and Earth's magnetic fields to determine the internal structure of Earth.	NA	NA	NA	NA
8-3.3 Infer an earthquake's epicenter from seismographic data.	NA	NA	NA	NA
8-3.4 Explain how igneous, metamorphic, and sedimentary rocks are interrelated in the rock cycle.	NA	NA	NA	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-3.5 Summarize the importance of minerals, ores, and fossil fuels as Earth resources on the basis of their physical and chemical properties.	Earth's resources have physical and chemical properties that make them important and useful. *Minerals* are solid materials that compose rocks. *Ores* are minerals that are mined. *Fossil fuels* come from the remains of living things and give off energy when they are burned.	Identify the physical or chemical properties that make an Earth resource useful (e.g., the ability of fossil fuels to burn).	Identify the physical property that makes an Earth resource useful (e.g., the hardness of rock, the light weight of aluminum).	NA
8-3.6 Explain how the theory of plate tectonics accounts for the motion of the lithospheric plates, the geologic activities at the plate boundaries, and the changes in landform areas over geologic time.	NA	NA	NA	NA
8-3.7 Illustrate the creation and changing of landforms that have occurred through geologic processes (including volcanic eruptions and mountain-building forces).	Landforms of Earth can be created or changed by volcanic eruptions.	Illustrate the changing of land forms that occur from volcanic eruptions.	Recognize that volcanoes can erupt (e.g., simulate a volcanic eruption).	NA
8-3.8 Explain how earthquakes result from forces inside Earth.	An *earthquake* is the result of forces pushing or pulling on rocks inside Earth.	Explain the cause of an earthquake as a push-pull inside Earth.	Identify the cause of an earthquake as a push-pull inside Earth.	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-3.9 Identify and illustrate geologic features of South Carolina and other regions of the world through the use of imagery (including aerial photography and satellite imagery) and topographic maps.	High-flying aircraft and satellites great distances above Earth use cameras to gather information about Earth's landforms.	Identify geologic features of South Carolina by using aerial photographs.	Identify geologic features of South Carolina by using 3-D models or pictures.	NA

Grade 8

STANDARD 8-4

Standard 8-4: The student will demonstrate an understanding of the characteristics, structure, and predictable motions of celestial bodies. (Earth Science)

Extended Standard: The student will demonstrate an understanding that objects in space have observable features and motions and that these objects can affect Earth..

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-4.1 Summarize the characteristics and movements of objects in the solar system (including planets, moons, asteroids, comets, and meteors).	Objects in the solar system have characteristics such as surface features, atmosphere, and movement. Planets, which may have a gaseous or a terrestrial surface, revolve around the Sun and rotate on their axes. Moons orbit planets.	Identify objects in the solar system (Sun, Moon, planets, comets).	Identify objects in the solar system (Sun, Moon, planets).	Identify objects in the solar system (e.g., Sun, Moon).
8-4.2 Summarize the characteristics of the surface features of the Sun: photosphere, corona, sunspots, prominences, and solar flares.	NA	NA	NA	NA
8-4.3 Explain how the surface features of the Sun may affect Earth.	The surface of the Sun radiates light and heat.	Explain how the Sun affects Earth.	Recognize that light and heat come from the Sun.	Recognize that light and heat come from the Sun.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-4.4 Explain the motions of Earth and the Moon and the effects of these motions as they orbit the Sun (including day, year, phases of the Moon, eclipses, and tides).	Earth takes a day to rotate on its axis. Earth takes a year to revolve around the Sun. The Moon takes about a month to revolve around Earth.	Explain the effect of Earth's revolving around the sun (i.e., four seasons in a year) and the effect of Earth's rotation on its axis (day and night in 24 hours).	Identify the effects (day and night) of Earth's rotation on its axis.	Identify day and night.
8-4.5 Explain how the tilt of Earth's axis affects the length of the day and the amount of heating on Earth's surface, thus causing the seasons of the year.	If the tilt of Earth is toward the Sun, the days are longer and warmer and the season is summer. If the tilt of Earth is away from the Sun, the days are shorter and colder and the season is winter.	Explain the relationship between the seasons and the length of days.	Identify Earth's seasons and relate them to Earth's position relative to the Sun.	Recognize Earth's seasons and temperature changes.
8-4.6 Explain how gravitational forces are influenced by mass and distance.	NA	NA	NA	NA
8-4.7 Explain the effects of gravity on tides and planetary orbits.	The Moon and Earth pull on each other because of gravity. The Moon's pull on Earth makes the level of the oceans rise and fall. Such changes are called *tides*.	Identify tides as a change in the level of Earth's oceans as a result of the pull of the Moon's gravity.	Recognize that tides are the daily changes in the level of the ocean.	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-4.8 Explain the difference between mass and weight by using the concept of gravitational force.	NA	NA	NA	NA
8-4.9 Recall the Sun's position in the universe, the shapes and composition of galaxies, and the distance measurement unit (light year) needed to identify star and galaxy locations.	NA	NA	NA	NA
8-4.10 Compare the purposes of the tools and the technology that scientists use to study space (including various types of telescopes, satellites, space probes, and spectroscopes).	Telescopes make distant objects in space look larger and brighter to us.	Identify the tool (i.e., telescope) that makes objects in space look larger and brighter.	Identify the tool (i.e., telescope) that scientists use to study objects in space.	NA

Grade 8

STANDARD 8-5

Standard 8-5: The student will demonstrate an understanding of the effects of forces on the motion of an object. (Physical Science)

Extended Standard: The student will demonstrate an understanding that an object in motion has a position, direction, and speed at any point in time and can be affected by various forces.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-5.1 Use measurement and time-distance graphs to represent the motion of an object in terms of its position, direction, or speed.	NA	NA	NA	NA
8-5.2 Use the formula for average speed, v = d/t, to solve real-world problems.	NA	NA	NA	NA
8-5.3 Analyze the effects of forces (including gravity and friction) on the speed and direction of an object.	*Gravity* is a universal force that always attracts or pulls objects toward each other without direct contact. Earth's gravity pulls objects toward the center of Earth. *Friction* is a force that resists motion; it occurs when one object rubs against another object.	Analyze the effects of friction on the speed of objects.	Illustrate the effect of gravity or friction on the motion of an object.	Recognize that gravity makes objects fall downward when they are released.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-5.4 Predict how varying the amount of force or mass will affect the motion of an object.	The greater the force applied to an object, the faster it will move. The greater the mass of an object, the greater the force needed to move it.	Predict how changing the mass or changing the force will affect the motion of an object (e.g., hard push or light push on one object, same force on a heavy or light object).	Predict how the motion of objects with different masses will be affected by the same force (e.g., which will roll faster when the same amount of force is applied, a golf ball or a ping-pong ball?).	Recognize that a heavy object will be harder to move than a lighter object.
8-5.5 Analyze the resulting effect of balanced and unbalanced forces on an object's motion in terms of magnitude and direction.	NA	NA	NA	NA
8-5.6 Summarize and illustrate the concept of inertia.	NA	NA	NA	NA

Grade 8

STANDARD 8-6

Standard 8-6: The student will demonstrate an understanding of the properties and behaviors of waves. (Physical Science)

Extended Standard: The student will demonstrate an understanding that there are many different types of waves and that each wave has properties and behaviors that are influenced by various factors.

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-6.1 Recall that waves transmit energy but not matter.	NA	NA	NA	NA
8-6.2 Distinguish between mechanical and electromagnetic waves.	NA	NA	NA	NA
8-6.3 Summarize factors that influence the basic properties of waves (including frequency, amplitude, wavelength, and speed).	NA	NA	NA	NA
8-6.4 Summarize the behaviors of waves (including refraction, reflection, transmission, and absorption).	NA	NA	NA	NA
8-6.5 Explain hearing in terms of the relationship between sound waves and the ear.	NA	NA	NA	NA

		COMMUNICATION LEVELS		
Indicator	**Essential Knowledge**	**Abstract Symbolic**	**Concrete Symbolic**	**Pre-Symbolic**
8-6.6 Explain sight in terms of the relationship between the eye and the light waves emitted or reflected by an object.	NA	NA	NA	NA
8-6.7 Explain how the absorption and reflection of light waves by various materials result in the human perception of color.	NA	NA	NA	NA
8-6.8 Compare the wavelength and energy of waves in various parts of the electromagnetic spectrum (including visible light, infrared, and ultraviolet radiation).	NA	NA	NA	NA

Appendix A

Revised Bloom's Taxonomy

In 1956, Benjamin Bloom and his colleagues published the *Taxonomy of Educational Objectives: The Classification of Educational Goals*, a groundbreaking book that classified educational goals according to the cognitive processes that learners must use in order to attain those goals. The work, which was enthusiastically received, was utilized by teachers to analyze learning in the classroom for nearly fifty years.

However, research during that time span generated new ideas and information about how learners learn and how teachers teach. Education practice is very different today. Even the measurement of achievement has changed; teachers now live in a standards-based world defined by state accountability systems.

In order to reflect the new data and insights about teaching and learning that the past forty-five years of research have yielded—and to refocus educators' attention on the value of the original Bloom's taxonomy—Lorin Anderson and David Krathwohl led a team of colleagues in revising and enhancing that system to make it more usable for aligning standards, instruction, and assessment in today's schools. The results of their work were published in 2001 as *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives* (New York: Allyn and Bacon)—a book that is important to educators because it provides the common understanding of expectations that is critical for improving student achievement in all subjects.

The revised taxonomy is two-dimensional, identifying both the kind of knowledge to be learned (knowledge dimension) and the kind of learning expected from students (cognitive processes) to help teachers and administrators improve alignment and rigor in the classroom. This taxonomy will assist educators to improve instruction, to ensure that their lessons and assessments are aligned with one another and with the state standards, that their lessons are cognitively rich, and that instructional opportunities are not missed.

Science goes well beyond simple recognition and the memorization of facts that many people mistake for scientific literacy. Therefore, many of the main verbs in the indicators of the South Carolina science standards reflect the cognitive processes described in the revised Bloom's taxonomy under the category *understand*. This category requires *interpreting, exemplifying, classifying, summarizing, inferring, comparing*, and *explaining* from students—understanding rather than rote memorization of materials. Students might have to *compare* two organisms or *explain* how variations in habitats affect the survival of an organism. Several indicators require students to demonstrate two even higher categories of cognitive processes—*analyze* and *evaluate*—by *organizing* and *critiquing* data and/or the results of scientific investigation, for example.

Tables 1 and 2 on the following pages are reproduced from Anderson and Krathwohl's *Taxonomy for Learning, Teaching, and Assessing*, pages 46 and 67, respectively. Table 3, "A Taxonomy for Teaching, Learning, and Assessing," describes both dimensions of the taxonomy: types and subtypes of knowledge described in table 1 and the cognitive categories and processes described in table 2. This matrix is provided as a template for teachers to use in analyzing their instruction as they seek to align standards, units/lessons/activities, and assessments. Examples and more information about specific uses of the matrix can be found in the *Taxonomy for Learning*.

Table 1: The Knowledge Dimension		
MAJOR TYPES AND SUBTYPES		**EXAMPLES**
A. FACTUAL KNOWLEDGE—The basic elements students must know to be acquainted with a discipline or solve problems in it		
AA.	Knowledge of terminology	Technical vocabulary, musical symbols
AB.	Knowledge of specific details and elements	Major natural resources, reliable sources of information
B. CONCEPTUAL KNOWLEDGE—The interrelationships among the basic elements within a larger structure that enable them to function together		
BA.	Knowledge of classifications and categories	Periods of geological time, forms of business ownership
BB.	Knowledge of principles and generalizations	Pythagorean theorem, law of supply and demand
BC.	Knowledge of theories, models, and structures	Theory of evolution, structure of Congress
C. PROCEDURAL KNOWLEDGE—How to do something, methods and inquiry, and criteria for using skills, algorithms, techniques, and methods		
CA.	Knowledge of subject-specific skills and algorithms	Skills used in painting with watercolors, whole-number division algorithm
CB.	Knowledge of subject-specific techniques and methods	Interviewing techniques, scientific method
CC.	Knowledge of criteria for determining when to use appropriate procedures	Criteria used to determine when to apply a procedure involving Newton's second law, criteria used to judge the feasibility of using a particular method to estimate business costs
D. METACOGNITIVE KNOWLEDGE—Knowledge of cognition in general as well as awareness and knowledge of one's own cognition		
DA.	Strategic knowledge	Knowledge of outlining as a means of capturing the structure of a unit of subject matter in a textbook, knowledge of the use of heuristics
DB.	Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge	Knowledge of the types of tests particular teachers administer, knowledge of the cognitive demands of different tasks
DC.	Self-knowledge	Knowledge that critiquing essays is a personal strength, whereas writing essays is a personal weakness; awareness of one's own knowledge level

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Table 2: The Cognitive Process Dimension		
CATEGORIES & COGNITIVE PROCESSES	**ALTERNATIVE NAMES**	**DEFINITIONS AND EXAMPLES**
1. REMEMBER—Retrieve relevant knowledge from long-term memory		
1.1 RECOGNIZING	Identifying	Locating knowledge in long-term memory that is consistent with presented material (e.g., Recognize the dates of important events in United States history)
1.2 RECALLING	Retrieving	Retrieving relevant knowledge from long-term memory (e.g., Recall the dates of important events in United States history)
2. UNDERSTAND—Construct meaning from instructional messages, including oral, written, and graphic communication		
2.1 INTERPRETING	Clarifying, paraphrasing, representing, translating	Changing from one form of representation (e.g., numerical) to another (e.g., verbal) (e.g., Paraphrase important speeches and documents)
2.2 EXEMPLIFYING	Illustrating, instantiating	Finding a specific example or illustration of a concept or principle (e.g., Give examples of various artistic painting styles)
2.3 CLASSIFYING	Categorizing, subsuming	Determining that something belongs to a category (e.g., Classify observed or described cases of mental disorders)
2.4 SUMMARIZING	Abstracting, generalizing	Abstracting a general theme or major point(s) (e.g., Write a short summary of events portrayed on a videotape)
2.5 INFERRING	Concluding, extrapolating, interpolating, predicting	Drawing a logical conclusion from presented information (e.g., In learning a foreign language, infer grammatical principles from examples)
2.6 COMPARING	Contrasting, mapping, matching	Detecting correspondences between two ideas, objects, and the like (e.g., Compare historical events to contemporary situations)
2.7 EXPLAINING	Constructing models	Constructing a cause-and-effect model of a system (e.g., Explain the causes of important 18th Century events in France)
3. APPLY—Carry out or use a procedure in a given situation		
3.1 EXECUTING	Carrying out	Applying a procedure to a familiar task (e.g., Divide one whole number by another whole number, both with multiple digits)
3.2 IMPLEMENTING	Using	Applying a procedure to an unfamiliar task (e.g., Use Newton's Second Law in situations in which it is appropriate)

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Table 3: A Taxonomy for Teaching, Learning, and Assessing

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. Remember— Retrieve relevant knowledge from long-term memory 1.1 Recognizing 1.2 Recalling	**2. Understand—** Construct meaning from instructional messages including oral, written, and graphic communication 2.1 Interpreting 2.2 Exemplifying 2.3 Classifying 2.4 Summarizing 2.5 Inferring 2.6 Comparing 2.7 Explaining	**3. Apply—**Carry out or use a procedure in a given situation 3.1 Executing 3.2 Implementing	**4. Analyze—**Break material into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose 4.1 Differentiating 4.2 Organizing 4.3 Attributing	**5. Evaluate—**Make judgments based on criteria and standards 5.1 Checking 5.2 Critiquing	**6. Create—**Put elements together to form a coherent or functional whole; reorganize elements into a new pattern or structure 6.1 Generating 6.2 Planning 6.3 Producing
A. Factual Knowledge—The basic elements that students must know to be acquainted with a discipline or solve problems in it AA. Knowledge of terminology AB. Knowledge of specific details and elements						
B. Conceptual Knowledge—The interrelationships among the basic elements within a larger structure that enable them to function together BA. Knowledge of classifications and categories BB. Knowledge of principles and generalizations BC. Knowledge of theories, models, and structures						
C. Procedural Knowledge—How to do something, methods of inquiry, and criteria for using skills, algorithms, techniques, and methods CA. Knowledge of subject-specific skills and algorithms CB. Knowledge of subject-specific techniques and methods CC. Knowledge of criteria for determining when to use appropriate procedures						
D. Metacognitive Knowledge—Knowledge of cognition in general as well as awareness of one's own cognition DA. Strategic knowledge DB. Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge DC. Self-knowledge						

Appendix B

Students with Significant Cognitive Disabilities: Three Levels of Symbolic Communication

Presymbolic

- Has not yet acquired the skills to discriminate between pictures or other symbols (and does not use symbols to communicate). May or may not use objects to communicate. May or may not use idiosyncratic gestures, sounds/vocalizations, and movements/touch to communicate with others.
- Students may use motor initiation to communicate their wants/needs (e.g., going to the kitchen when hungry, going to the door when playing outside is desired).
- A direct and immediate relationship between a routine activity and the student's response may or may not be apparent. The student may have the capacity to sort very different objects, may be trial and error. Mouthing and manipulation of objects leads to knowledge of how objects are used. May combine objects (e.g., place one block on another).

Concrete Symbolic

- May use some symbols to communicate (e.g., pictures, logos, objects). Beginning to acquire symbols as part of a communication system.
- May have limited emerging functional academic skills. Identification of neutral items may be emerging, but representations will probably need to be related to the student's immediate environment (e.g., digital picture of Walmart for community based instruction) and needs (e.g., hand a picture from schedule for lunch when hungry).

Abstract Symbolic

- Communicates with symbols (e.g., pictures, numbers) or words (e.g., spoken words, assistive technology, ASL, home signs). May have emerging or basic functional academic skills. Emerging writing or graphic representation for the purpose of conveying meaning through writing, drawing, or computer keying.

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