Extended Core Standards for

Students With Significant Cognitive Disabilities

Science Standards

Grade Levels K–12

Utah State Office of Education 250 East 500 South P.O. Box 144200 Salt Lake City, UT 84114-4200 Patti Harrington, Ed.D., State Superintendent of Public Instruction

GRADE LEVEL EXTENDED CORE SCIENCE STANDARDS FOR STUDENTS WITH SIGNIFICANT COGNITIVE DISABILITIES

For

The Utah State Office of Education

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Introduction to the Extended Core Standards

The school-age population is made up of students with a variety of unique abilities and diverse needs, including students who are gifted and talented and students with disabilities who may require specialized instruction or accommodations to achieve educational success. In recent years, a heightened national focus on assessment and achievement and the authorization of the No Child Left Behind Act (NCLB) has prompted increased attention from curriculum, instruction and assessment professionals, especially for students receiving special education and related services. While many students with disabilities participate in regular instruction and assessment programs with varying degrees of accommodations, students with significant cognitive disabilities may be eligible for an alternate assessment based on alternate achievement standards. The eligibility decision is made by the Individualized Education Program (IEP) Team.

The Utah Core Curriculum represents standards of learning that are “essential for all students. They are the ideas, concepts, and skills that provide a foundation on which subsequent learning may be built” (Core Curriculum, Utah State Office of Education). This Core Curriculum is the driving force for instruction and assessment in the State of Utah. In order for students who have significant cognitive disabilities to access the Core Curriculum, the Extended Core Standards have been developed.

The Development of the Extended Core Standards

The Extended Core Standards describe academic content towards which students with significant cognitive disabilities should work to achieve competencies in math, science and English language arts (ELA) at each grade level from kindergarten through twelfth grade. The Extended Core Standards have been developed over several years, reviewed by numerous local and national experts in curriculum and special education including, special educators, teachers representing all grades, university educators, curriculum and assessment professionals at the Utah State Office of Education (USOE), parents of students with significant cognitive disabilities and/or representatives from the Utah Parent Center (UPC).

Design and Organization of the Extended Core Standards

The Extended Core Standards are designed to assist teachers to organize and deliver challenging academic instruction to students with significant cognitive disabilities through access to the Utah Core Curriculum in math, science, and English language arts. Math, science, and elementary English language arts Extended Core Standards are organized by grade level while secondary English language arts Extended Core Standards are organized by grade bands (7–8, 9–10, and 11–12).

Each content area begins with a **Standard**—a broad statement of what all students are expected to understand. The curriculum standard is followed by the **Element of the Standard** - a statement of specific expectations and basic principles of the standard. The **Extended Core Standard**—a statement of what a student with a significant cognitive disability is expected to understand at each grade level completes the Extended Core Standards. Examples are intended to demonstrate practical and functional application of the Core Standards.

As with the Utah Core Curriculum for all students, the Extended Core Standards "should be taught with respect for differences in learning styles, rates of learning, and individual capabilities without losing sight of the common goals" (Core Curriculum, Utah State Office of Education). While the Extended Core Standards were created from academic expectations, it is understood that students with significant cognitive disabilities also require functional skills as part of daily instruction. Appropriate functional skill goals coupled with the extended core academic curriculum will serve as important instructional goals and expectations.

Any mode of communication or assistive technology that benefits a student may be used for instruction of the Extended Core Standards. The description of the Extended Core Standards may imply a specific type of communication such as verbal or written response, but any understandable communication is acceptable. Information may be conveyed by the student verbally, through sign language, eye gaze, using picture cards, or any other manner through which the student typically communicates

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FOR STUDENTS WITH SIGNIFICANT COGNITIVE DISABILITIES

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Standard	Elements of Standard	Extended Core—Depth of Understanding		
III. Students will develop an understanding of their environment.	1. Observe typical weather for each season.	III. 1a. Observe pictures or video of each of the seasons.	III. 1b. Observe pictures or video of each of the seasons and identify select symbols that represent each season.	III. 1c. Observe each season as it occurs and identify select symbols that represent each season.
	2. Demonstrate different behavior for winter versus summer.	III. 2a. Show the capacity to act differently in winter compared to summer.	III. 2b. Understand that personal behavior changes in winter compared to summer. Example: When asked, "What do you do in the summer that you do not do in the winter?" (and vice versa), respond correctly (can be a variety of correct responses).	
	3. Observe animals.	III. 3a. Observe animals in the local environment (in person or through video).	III. 3b. Imitate the sounds and or actions of familiar animals.	

GRADE 1 STANDARD III

Standard	Elements of Standard	Extended Core—Depth of Understanding		
III. Students will develop an understanding of their environment.	1. Observe familiar plants.	III. 1a. Observe plants in the local environment in person and interact with them through touch.	III. 1b. Observe plants in the local environment in person and interact with them through touch.	III. 1c. Observe and draw plants in the local environment.
	2. Observe seeds.	III. 2a. Observe several different kinds of seeds by looking and feeling.	III. 2b. Observe seeds and draw the seeds.	III. 2c. Observe seeds over time as they grow from seed to small plant.
	3. Investigate seeds in fruit or vegetables.	III. 3a. Observe seeds in fruit or vegetables by looking and feeling.	III. 3b. Understand that seeds from fruit or vegetables grow into plants that produce more fruit.	
	4. Investigate water as a solid and a liquid.	III. 4a. Observe (by looking and feeling) water as a liquid and a solid.	III. 4b. Observe ice melting and becoming liquid.	III. 4c. Describe how to make ice into liquid (water).
	5. Observe objects floating and sinking in water.	III. 5a. Observe objects floating and sinking in water.	III. 5b. Describe (draw) objects floating and sinking in water.	III. 5c. Being presented with various objects, predict whether they will sink or float in water.

GRADE 2 STANDARD III

Standard	Elements of Standard	Extended Core—Depth of Understanding		
III. Students will develop an understanding of their environment.	1. Observe animals at different stages of their lifecycle. (Example: Caterpillars turn into butterflies.)	III. 1a. Observe animals at different stages of their lifecycle. This can be, but does not have to be, a metamorphic lifecycle.	III. 1b. Draw animals as they appear at different stages of their lifecycles.	
	2. Observe plants at different stages of their lifecycles. (Example: Flower seeds, flowers budding, and flowers fully bloomed.)	III .2a. Observe plants at different stages of their lifecycles.	III. 2b. Draw plants as they appear at different stages of their lifecycles.	
	3. Understand that weather affects people and animals.	III. 3a. Observe weather as it occurs.	III. 3b. Match symbols representing weather to weather as observed.	III. 3c. Observe and describe or draw weather as it occurs.

GRADE 3 STANDARD I

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Ia. Observe simple objects and patterns and report their observations. Example: Observe pictures of Earth and the moon and draw (or otherwise represent) the observation.	ILO 1 Ib. Follow instructions to conduct a simple investigation (collect data). Example: Observe pictures of Earth and the moon and report differences between the two.	
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Ia. Communicate an observation accurately. Example: Observe pictures of Earth and the moon and draw (or otherwise represent) the observation.	ILO 4 Ib. Communicate an observation using science language. Example: Observe picture of Earth and the moon and accurately model a three-dimensional representation of each.	
I. Students will understand that the shape of Earth and the moon are spherical and that Earth rotates on its axis to produce the appearance of the sun and moon moving through the sky.	Recognize the shape of Earth and the moon. (e.g., the difference between a cube and a ball).	Content Ia. Identify the two-dimensional shape of Earth and the moon. Example: Given choices of shapes (including a circle), student identifies the circle as the shape of Earth and the moon.	Content Ib. Draw the two-dimensional shape of Earth and the moon when prompted.	Content Ic. Recognize the three-dimensional shape of Earth and the moon. Example: Given choices of three-dimensional objects (including a sphere), student identifies the sphere as the shape of Earth and the moon.

GRADE 3 STANDARD II

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1 Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIa. Observe simple objects and patterns and report their observations. Example: Given a set of weather cards, student identifies current weather (e.g., sunny, cloudy, some clouds, rain, snow, windy).		ILO 1 IIb. Follow instructions to conduct a simple investigation (collect data). Example: Student observes weather on five different days and records different aspects of the weather [e.g., amount of precipitation in inches, relative amount of wind (e.g., no wind, a little wind, very windy), temperature each day].
ILO 4 Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIa. Communicate an observation accurately. Example: Observe a living organism and describe several characteristics of the organism.		ILO 4. IIb. Communicate an observation using science language. Example: Student quantifies (uses numbers) to represent observations of living organisms.
II. Students will understand that organisms depend on living and nonliving things within their environment.	Determine common characteristics of living organisms that are observed.	Content IIa. Observe a living organism and describe several characteristics of the organism. Example: Student observes a dog and describes it as furry and friendly.	Content IIb. Observe several living organisms and describe several characteristics they have in common. Example: Student observes two organisms (e.g., dog and fish or horse and tree) [note: the organisms should not be too similar so as to negate the purpose of the activity (e.g., dachshund and shepherd)] and recognizes two common characteristics (e.g., they move and have mouths).	II. Students will understand that organisms depend on living and nonliving things within their environment.

GRADE 3 STANDARD III

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1 Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIIa Observe simple objects and patterns and report their observations. Example: Investigate how applying different forces to an object cause it to act differently.		ILO 1 IIIb. Follow instructions to conduct a simple investigation (collect data). Example: Given two piles of sand of equal size, blow on one, pour water over the other, determine how much sand moved (or remained) by measuring the mass or amount of sand, record this information.
ILO 4 Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIIa. Communicate an observation accurately. Example: Observe objects affected by different forces (i.e., amount, direction) and communicate the result.		
III: Students will understand the relationship between the force applied to an object and resulting motion of the object.	Demonstrate how forces cause changes to how an object moves.	Content IIIa. Investigate how applying different forces to an object cause it to act differently. Example: Student is given a car and encouraged to see how pushing it or pulling it in different ways causes different things to happen.	Content IIIb. Describe how applying different forces to an object cause it to act differently. Example: Student describes that pushing behind a toy car causes it to go forward, but pushing down on the car does not cause it to move.	III: Students will understand the relationship between the force applied to an object and resulting motion of the object.

GRADE 3 STANDARD IV

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1 Use science process and thinking skills.	Conduct simple investigations	ILO 1 IVa. Observe simple objects and patterns and report their observations. Example: After observing two different objects falling, student should describe some difference in their motion (e.g., the paper "floated" and the ball fell straight down).		ILO 1 IVb. Follow instructions to conduct a simple investigation (collect data). Example: After observing two different objects falling, student should describe that they both fell towards the ground.
ILO 4 Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IVa. Communicate an observation accurately. Example: Observe objects falling to the ground and describe (through some means) how the objects looked as they fell.		ILO 4. IVb. Communicate an observation using science language. Example: Describe that objects fall to the ground when dropped and that it is because of gravity.
IV: Students will understand that objects near Earth are pulled toward Earth by gravity.	Observe and compare different objects falling.	Content IVa. Observe two objects falling. Example: Student will observe sets of objects falling. A variety of different sets should be demonstrated and the instructor should describe what is occurring.	Content IVb. Describe the differences in how two objects fall. Example: After observing two different objects falling, student should describe some difference in their motion (e.g., the paper “floated” and the ball fell straight down).	Content IVc. Describe the similarity of two objects falling. Example: After observing two different objects falling, student should describe that they both fell towards the ground.

GRADE 3 STANDARD V

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1 Use science process and thinking skills.	Conduct simple investigations	ILO 1 Va. Observe simple objects and patterns and report their observations. Example: Observe/be exposed to a variety of objects (manmade and natural) that produce heat and some that do not. Report which objects produce heat (e.g., are hot) and which do not.		ILO 1 Vb. Follow instructions to conduct a simple investigation (collect data). Example: Complete a guided experiment of being close to a heat producing source, then slowly moving away. At each point (at least four), student identifies how much (e.g., a lot, less, a little) heat they feel.
ILO 4 Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Va. Communicate an observation accurately. Example: Observe/be exposed to a variety of objects (manmade and natural) that produce heat and some that do not. Report which objects produce heat (e.g., are hot) and which do not.		ILO 4. Vb. Communicate an observation using science language. Example: Observe the sun and identify and communicate the two things the sun produces (i.e., light and heat).
V: Students will understand that the sun is the main source of heat and light for things living on Earth. They will also understand that the motion of rubbing objects together may produce heat.	List and demonstrate things that produce heat.	Content Va. Identify objects that produce heat. Example: Some sample objects: the sun, light bulb, stove.	Content Vb. Identify manmade objects that produce heat. Example: Some sample objects: iron, stove, light bulb.	V: Students will understand that the sun is the main source of heat and light for things living on Earth. They will also understand that the motion of rubbing objects together may produce heat.

GRADE 4 STANDARD I

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Ia. Observe simple objects and patterns and report their observations. Example: Determine that ice melts when heated.		ILO 1 Ib. Follow instructions to conduct a simple investigation (collect data). Example: When directed to, cause ice to melt (e.g., hold ice in hand, place ice on a hot surface, let ice sit out in a room).	
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Ia. Communicate an observation accurately. Example: Use pictures to represent a "before" appearance of ice and an "after" appearance of ice when placed in the sun.		ILO 4 Ib. Communicate an observation using science language. Example: Use some form of representation (e.g., pictures, words) to accurately represent that heat causes ice to melt or water to evaporate.	
I. Students will understand that water changes state as it moves through the water cycle.	Students will understand that energy from the sun causes water to melt or evaporate.	Content Ia. Understand that ice melts when heated. Example: When directed to, cause ice to melt (e.g., hold ice in hand, place ice on a hot surface, let ice sit out in a room).	Content Ib. Understand that sunlight can provide heat for ice to melt. Example: Determine the difference between what happens when an ice cube is placed in sunlight and when an ice cube is placed in the shade; conclude that the sun provides heat for the ice to melt.	Content Ic. Understand that water evaporates when heated. Example: When directed to, cause water to evaporate (e.g., place water on a hot surface, let water sit out in a room over time).	Content Id. Understand that sunlight can provide heat for water to evaporate. Example: Determine the difference between what happens when liquid water is placed in sunlight and when liquid water is placed in the shade; conclude that the sun provides heat for the water to evaporate.

GRADE 4 STANDARD II

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIa. Observe simple objects and patterns and report observations. Example: Given a set of weather cards, student identifies current weather (e.g., sunny, cloudy, some clouds, rain, snow, windy).	ILO 1 IIb. Follow instructions to conduct a simple investigation (collect data). Example: Student observes weather on five different days and records different aspects of the weather (e.g., amount of precipitation in inches, relative amount of wind [e.g., no wind, a little wind, very windy], and temperature each day).	
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIa. Communicate an observation accurately. Example: Student accurately communicates several aspects of the weather through some format (e.g., pictures, models, words).	ILO 4 IIb. Communicate an observation using science language. Example: Student accurately links the scientific terminology to measures/observations made (e.g., temperature, precipitation, cloud type).	
II. Students will understand that the elements of weather can be observed, measured, and recorded to make predictions and determine simple weather patterns.	Students will observe and record weather information in order to make a prediction.	Content IIa. Identify current weather using established symbols. Example: Given a set of weather cards, student identifies current weather (e.g., sunny, cloudy, some clouds, rain, snow, windy).	Content IIb. Measure and record relative amounts of specific precipitation and wind over a week's time. Example: Student observes weather five different days and records precipitation in inches, and relative amount of wind (e.g., no wind, a little wind, very windy).	Content IIc. Measure and record daily temperature over a week's time. Example: Student observes weather on five different days and records the temperature each day.

GRADE 4 STANDARD III

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIIa. Observe simple objects and patterns and report observations. Example: Observe water being poured over a pile of dirt and report what happens to the small particles of dirt (this could also be done with a stream table or a video of river erosion).		ILO 1 IIIb. Follow instructions to conduct a simple investigation (collect data). Example: Given two piles of sand of equal size, blow on one and pour water over the other, then determine how much sand moved (or remained) by measuring the mass or amount of sand; record this information.		
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIIa. Communicate an observation accurately. Example: Use a series of pictures or descriptions to represent how an object affected by erosion changes over time.		ILO 4 IIIb. Communicate an observation using science language. Example: Draw a picture of weathering and a picture of erosion and accurately label each picture.		
III. Students will understand the basic properties of rocks, the processes involved in the formation of soils, and the needs of plants provided by soil.	Understand the concepts of weathering and erosion.	Content IIIa. Demonstrate a way to break down a large object. Example: Given a Lego structure, break it into smaller parts.	Content IIIb. Demonstrate a way to move small parts of a whole. Example: Move a deck of cards across the table card by card.	Content IIIc. Demonstrate a way to move soil without moving the entire amount at once. Example: Given a pile of dirt, move it to a new location in small amounts (e.g., blow on a pile of dirt, use small cups to move a pile of dirt, pour water on a pile of dirt).	Content IIId. Understand the term *erosion*. Example: Demonstrate an understanding of the term *erosion* by using sentences, diagrams, models, etc.	Content IIIe. Understand the term *weathering*. Example: Demonstrate an understanding of the term *weathering* by using sentences, diagrams, models, etc.

GRADE 4 STANDARD IV

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IVa. Observe simple objects and patterns and report observations. Example: If given a picture of a fossilized leaf, state that it is a leaf or it looks like a leaf.		ILO 1 IVb. Follow instructions to conduct a simple investigation (collect data). Example: Given a fossilized fish, draw what the fossil looks like; compare the drawing to five different known organisms (e.g. cow, trout, tree, dog and flower) and determine the fossil is most like the trout.	
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IVa. Communicate an observation accurately. Example: State that a fossil represents something that was living at some time.		ILO 4 IVb. Communicate an observation using science language. Example: Create a series of pictures representing a living thing (e.g., tree, bird) becoming a fossil. Example: pictures representing something living, dying, being found in a rock.	
IV. Students will understand how fossils are formed, where they may be found in Utah, and how they can be used to make inferences.	Given a fossil, make an accurate inference about the original organism. Note: picture of fossils, facsimiles of fossils, or reproductions of fossils can be used.	Content IVa. Identify a current or past living thing that is similar to a fossil. Example: If given a picture of a fossilized leaf, state that it is a leaf or it looks like a leaf.	Content IVb. Understand that a fossil represents a once-living thing. Example: State that a fossil represents something that was living at some time; create a series of pictures representing a living thing (e.g., tree, bird) becoming a fossil. Example: Pictures representing something living, dying, being found in a rock.	Content IVc. Infer a modern organism similar to the fossil organism. Example: Given a fossilized fish, determine that it could be a carp.	Content IVd. Accurately infer the original organism or type of organism when given a fossil. Example: Given a picture of trilobite, identify that it represents a trilobite of the past.

GRADE 4 STANDARD V

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Va. Observe simple objects and patterns and report observations. Example: Given a group of ten things that are either plants or animals, sort the group into plants or animals and display groupings.		ILO 1 Vb. Follow instructions to conduct a simple investigation (collect data). Example: Using a decision tree of two to four steps, determine whether an organism that the student is familiar or not familiar with is a plant or animal, and display the groupings.		
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Va. Communicate an observation accurately. Example: Draw or use another form of media to represent a plant or animal common to Utah.		ILO 4 Vb. Communicate an observation using science language. Example: Describe in words a plant or animal common to Utah.		
V. Students will understand the physical characteristics of Utah's wetlands.	Use a simple scheme to classify unfamiliar plants and animals.	Content Va. Identify a living organism as a plant. Example: Given a group of ten things that are either plants or animals, determine which are plants.	Content Vb. Indentify a living organism as an animal. Example: Given a group of ten things that are either plants or animals, determine which are animals.	Content Vc. Sort a group of plants and animals into those two categories. Example: Given a group of ten things that are either plants or animals, sort the group into plants or animals.	Content Vd. Use a simple scheme to classify a familiar plant or animal. Example: Using a decision tree of two to four steps, determine whether an organism that the student is familiar with is a plant or animal.	Content Ve. Use a simple scheme to classify an unfamiliar plant or animal. Example: Using a decision tree of two to four steps, determine whether an organism that the student is not familiar with is a plant or animal.

GRADE 5 STANDARD I

Standard	Elements of Standard	Extended Core—Depth of Understanding	
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Ia. Observe simple objects and patterns and report observations. Example: Given an object, describe physical properties of the object. (e.g., color, shape, size).	ILO 1 Ib. Follow instructions to conduct a simple investigation (collect data). Example: Via directions, student will observe and describe a physical property of the object, then perform a physical change to the object, then observe and describe the same physical property of the item and how the item has changed (e.g., observe a piece of ice, record that it is cold and a certain size, then crush the ice and observe that the ice is still cold but in smaller pieces).
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Ia. Communicate an observation accurately. Example: Given an object, describe physical properties of the object. (e.g., color, shape, size).	ILO 4 Ib. Communicate an observation using science language. Example: Given an object, describe the physical properties of the object before a physical change occurs, then observe the object after the change occurs, and describe how the original observation changed.
I. Students will understand that chemical and physical changes occur in matter.	Understand physical changes.	Content Ia. Describe a physical property of matter. Example: Given an object, describe physical properties of the object. (e.g., color, shape, size).	Content Ib. Describe the appearance of a substance before and after a physical change Example: Given an object, describe the physical properties of the object before and after the change occurs.

GRADE 5 STANDARD II

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIa. Observe simple objects and patterns and report observations. Example: Observe simple events involving weathering or erosion and describe what is occurring, being sure to identify the force involved in the process.		ILO 1 IIb. Follow instructions to conduct a simple investigation (collect data). Example: Follow instructions to use a force to cause either weathering or erosion; describe evidence that weathering or erosion occurred. Example: A student is instructed to blow (wind) on a pile of sand, and observes that the blowing caused the sand to move. Student could collect additional data on how much sand moved or remained and that the original amount of sand was reduced.	
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIa. Communicate an observation accurately. Example: Use a series of pictures to demonstrate the process of either weathering or erosion.		ILO 4 IIb. Communicate an observation using science language. Example: Explain how a specific force is involved in either weathering or erosion; the demonstration can be either words or some other form of media.	
II. Students will understand that volcanoes, earthquakes, uplift, weathering, and erosion reshape Earth's surface.	Identify or model the forces that cause weathering and erosion.	Content IIa. Demonstrate a way that some force (e.g., plants, animals, ice) can break down a large object. Example: Use a series of pictures to show how plants break down rock.	Content IIb. Demonstrate a way (e.g., gravity, wind, water) in which some force can move small parts of a whole. Example: Use a series of pictures to show how water moves dirt in a river.	Content IIc. Understand how different forces cause erosion. Example: Explain how gravity causes objects to fall, thereby moving them.	Content IId. Understand how different forces cause weathering. Example: Explain how ice causes objects to break apart.

GRADE 5 STANDARD III

Standard	Elements of Standard	Extended Core—Depth of Understanding	
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIIa. Observe simple objects and patterns and report observations. Example: Using a magnet and several objects that are both magnetic (e.g., steel) and non-magnetic (e.g., wood, plastic), determine which objects the magnet is attracted to (sticks to) and which objects the magnet is not attracted to (does not stick to).	ILO 1 IIIb. Follow instructions to conduct a simple investigation (collect data). Example: Place a set of magnets on a table and allow the student to play with them; student reports observations that sometimes the magnets attract each other and sometimes they do not attract, based on how they are positioned.
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIIa. Communicate an observation accurately. Example: Use some form of media to describe the interaction between magnets and other things.	ILO 4 IIIb. Communicate an observation using science language. Example: Use some form of media to describe the interaction of magnets to other magnets.
III. Students will understand that magnetism can be observed when there is an interaction between the magnetic fields of magnets or between a magnet and materials made of iron.	Determine that magnets can both attract and repel other magnets.	Content IIIa. Recognize that magnets are attracted to certain things. Example: Observe the magnets "stick" to certain things (e.g., magnets on refrigerators, magnets on steel poles).	Content IIIb. Conduct a loosely structured investigation about how magnets interact with other magnets. Example: Place a set of magnets on a table and allow the student to play with them; student reports his/her observations.

GRADE 5 STANDARD IV

Standard	Elements of Standard	Extended Core—Depth of Understanding	
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IVa. Observe simple objects and patterns and report observations. Example: Students will observe an act of static electricity (e.g., a balloon rubbed on hair "sticking" to the wall, shuffling feet before touching a door knob causing a shock) and report that there is something about the two objects that causes their behavior.	ILO 1 IVb. Follow instructions to conduct a simple investigation (collect data). Example: Students will follow instructions to bring about an observation of static electricity (e.g., rub a balloon on their hair, then stick it to a wall) and represent this demonstration in some format.
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IVa. Communicate an observation accurately. Example: Communicate an observation of an object with static electricity.	ILO 4 IVb. Communicate an observation using science language. Example: Communicate an observation of an object with static electricity and ascribe the term "static electricity" to that observation.
IV. Students will understand features of static and current electricity.	Describe the behavior of objects charged with static electricity.	Content IVa. Understand that objects can have static electricity. Example: Acknowledge that objects can have something called static electricity.	Content IVb. Describe the behavior of objects charged with static electricity. Example: State that objects with static electricity can stick to each other or generate a shock.

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Va. Observe simple objects and patterns and report observations. Example: When presented with an organism, describe some of its characteristics (e.g., a polar bear has white fur, a cactus has thick leaves).	ILO 1 Vb. Follow instructions to conduct a simple investigation (collect data). Example: Perform a simulation to determine an environment that something is better suited to survive in. Example: give a student a green colored object and three pieces of paper that are different colors (e.g., green, yellow, white). Have the student place the object on each piece of paper and determine on which color of paper the object is hardest to see.	
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Va. Communicate an observation accurately. Example: When presented with an organism, describe some of its characteristics (e.g., a polar bear has white fur, a cactus has thick leaves).	ILO 4 Vb. Communicate an observation using science language. Example: Use the terms *environment, traits*, and *survival* in a description (or other presentation/demonstration of understanding) of an organism that is best suited to survive in a certain place.	
V. Students will understand that traits are passed from the parent organisms to their offspring, and that sometimes the offspring may possess variations of these traits that may help or hinder survival in a given environment.	Identify environments where an organism is best suited to survive.	Content Va. Identify some characteristics of given organisms. Example: When presented with an organism, describe some of its characteristics (e.g., a polar bear has white fur, a cactus has thick leaves).	Content Vb. Given an organism, describe the environment in which the organism could survive. Example: When presented with an organism, describe what type of environment it would be good at living in (e.g., an arctic fox has thick fur, so it can live where it is cold).	Content Vc. Given an environment, describe characteristics of an organism that could help it live or survive there. Example: When presented with an environment, describe what characteristic of an organism would help it live there (e.g., giraffes with long necks can reach food in tall trees).

GRADE 6 STANDARD I

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Ia. Observe simple objects and patterns and report observations. Example: Observe a top spinning and label the motion as rotating.	ILO 1 Ib. Follow instructions to conduct a simple investigation (collect data). Example: Follow instructions to demonstrate how the moon is reflected by the sun.	
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Ia. Communicate an observation accurately. Example: Use a picture to represent something rotating or revolving.	ILO 4 Ib. Communicate an observation using science language. Example: Communicate the illuminated and shadowed parts of a moon diagram.	
I. Students will understand that the appearance of the moon changes in a predictable cycle as it orbits Earth and as Earth rotates on its axis.	Model an object revolving and an object rotating.	Content Ia. Demonstrate an object rotating. Example: Student spins around to demonstrate an object rotating.	Content Ib. Demonstrate an object revolving. Example: Student walks around a chair to demonstrate an object revolving.	Content Ic. Know how the moon, Earth, and the sun move in relationship to one another. Example: If given a model (or other representation) of the moon, Earth, and the sun in their relative positions, student will demonstrate how they move in relation to one another.

GRADE 6 STANDARD II

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIa. Observe simple objects and patterns and report observations. Example: When shown a model of the sun and Earth (with Earth accurately tilted on its axis), accurately report the observation that Earth is tilted.		ILO 1 IIb. Follow instructions to conduct a simple investigation (collect data). Example: Following instructions, set up a model that has the sun in the center of Earth's orbit. Connect Earth to the sun with a string. Measure the distance from the sun to Earth with Earth in at least four different positions. Record this data.	
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIa. Communicate an observation accurately. Example: Generate a model or diagram of the Earth and the Sun. Correctly represent that Earth is tilted on its axis.		ILO 4 IIb. Communicate an observation using science language. Example: Complete a representation of Earth at four points (representing each season) in its orbit. Represent the relative temperature (such as snow for cold in winter) at each season (e.g., diagram has the sun in the middle, Earth at four points; each is labeled as a season, and there is a picture of something representing temperature for each season).	
II. Students will understand how Earth tilting on its axis changes the length of daylight and creates the seasons.	Understand that Earth's position relative to the sun and its orientation in space (i.e., tilt) causes the seasons.	Content IIa. Recognize that Earth is tilted on its axis. Example: If given a globe, position the globe to show that Earth is at a tilt (e.g., not straight up and down, not "on its side").	Content IIb. Know that the daily temperature in Utah is different in different seasons. Example: When asked, "What season is it cold outside?" respond, “winter.”	Content IIc. Match different daily temperatures to the most likely season in which they occur. Example: Match the season to a relative daily temperature (e.g., summer to 90°F).	Content IId. Recognize that Earth is approximately the same distance from the sun at all points in its orbit. Example: When given a representation of the sun and Earth, show where Earth is at in its orbit during each season. Earth does not need to be tilted. Adequate response is simply that Earth is at a different point, but each point is equal distance from the sun.

GRADE 6 STANDARD III

Standard	Elements of Standard	Extended Core—Depth of Understanding	
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIIa. Observe simple objects and patterns and report their observations. Example: Given a diagram of the solar system, describe how the planets are arranged (e.g., they are located in circles of orbits around the sun and are at different distances from the sun).	ILO 1 IIIb. Follow instructions to conduct a simple investigation (collect data). Example: Relate how some technology that the student uses regularly was influenced by technology developed to explore the solar system. (Note: This is accessing ILO 5 and 6, but is appropriate here for the purposes of this document.)
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIIa. Communicate an observation accurately. Example: Given a diagram of the solar system, identify three planets.	ILO 4 IIIb. Communicate an observation using science language. Example: Given a diagram of the solar system, identify six planets and an additional object in our solar system.
III. Students will understand the relationship and attributes of objects in the solar system.	Identify components of the solar system.	Content IIIa. Identify at least three planets. Example: When prompted, student is able to communicate three planets.	Content IIIb. Identify at least six planets and an additional object (e.g., comet, satellite or meteor) in our solar system. Example: When prompted, student is able to communicate six planets and another extraterrestrial object.

GRADE 6 STANDARD IV

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IVa. Observe simple objects and patterns and report their observations. Example: Students will identify at least four objects in the room that are significantly (at least 1/10 their size) smaller than the student (e.g., pencil, cup, paperclip).		ILO 1 IVb. Follow instructions to conduct a simple investigation (collect data). Example: Identify objects that are significantly (at least 100 times larger) larger than the student is (e.g., mountain, city, planet earth).	
ILO 4 Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IVa. Communicate an observation accurately. Example: Student is presented with a circle at least four feet in diameter as a model of Earth. Student is prompted, "If this is the Earth, draw how big you would appear." Student attempts to draw himself or herself "very" small, less than one inch tall.		ILO 4 IVb. Communicate an observation using science language. Example: Student is presented with a circle at least four feet in diameter as a model of Earth. Student is prompted, "If this is the Earth, draw how big the school would appear and how big you would appear." Student attempts to draw the school "very" small (less than one inch) and himself or herself even smaller.	
IV. Students will understand the scale of size, distance between objects, movement, and apparent motion (due to Earth's rotation) of objects in the universe and how cultures have understood, related to and used these objects in the night sky.	Understand the concept of relative size of objects in the universe.	Content IVa. Understand that the student himself or herself is larger than certain objects (e.g., pencil, book) in the classroom. Example: Student will identify objects in the classroom that are smaller than the student is.	Content IVb. Understand that Earth is much larger than the student or the classroom. Example: If given a very small representation of himself or herself (a drawing of him/her no larger than one inch tall), identify the room as the Earth on this scale.	Content IVc. Understand that the solar system is much bigger than any area on Earth. Example: If given a very small representation of Earth (a drawing of Earth no larger than one inch in diameter), identify the room as the solar system on this scale.	Content IVd. Understand that the classroom is larger than he or she is and that Earth is much larger than the classroom. Example: If given a very small representation of himself or herself (a drawing of him/her no larger than one inch tall), identify the room as the Earth on this scale and the city as the solar system on this scale.

GRADE 6 STANDARD V

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Va. Observe simple objects and patterns and report their observations. Example: Perform an activity that simulates washing microorganisms off our hands (e.g., dirt applied to hands can represent microorganisms in this simulation). Student must conclude that washing hands removes things that can make us sick.	ILO 1 Vb. Follow instructions to conduct a simple investigation (collect data). Example: Observe a microorganism by viewing a prepared slide. Have students sketch what he/she sees. Slide does not necessarily have to be observed with a microscope.	
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Va. Communicate an observation accurately. Example: Create a poster which includes both parts of the following message: "Wash your hands so you don't get sick."	ILO 4. Vb. Communicate an observation using science language. Example: Observe a microorganism or a picture of a microorganism. Have students sketch what they see and title their drawing.	
V. Students will understand that microorganisms range from simple to complex, are found almost everywhere, and are both helpful and harmful.	Identify ways to overcome the negative effects of microorganisms.	Content Va. Know that we wash our hands and cook our food so we do not get sick. Example: Correctly respond to either of the following questions: Why do we wash our hands and cook our food? What is something you do to keep from getting sick?	Content Vb. Know that there are things that we cannot see (with the naked eye) that can make us sick. Example: Observe the growth of bacteria in an appropriately controlled environment.	Content Vc. Know that soap or cooking can stop microorganisms from hurting us. Example: Do something to prevent the growth of bacteria in a Petri dish.

GRADE 6 STANDARD VI

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 VIa. Observe simple objects and patterns and report observations. Example: Observe an energy-producing source and identify the type of energy being generated.	ILO 1 VIb. Follow instructions to conduct a simple investigation (collect data). Example: Student is instructed to hit a bell with different amounts of force. Student needs to communicate which hit produced the most energy.	
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 VIa. Communicate an observation accurately. Example: After observing several types of energy, represent energy coming from a source (e.g., rays coming from the sun representing light).	ILO 4 VIb. Communicate an observation using science language. Example: When given a prompt, a student produces an observable form of energy by ringing a bell to produce sound energy, turning on a flashlight to produce light energy, or rubbing hands together to produce heat energy. Student then draws a picture representation of the event and accurately identifies the type of energy and where the energy is represented in the picture.	
VI. Students will understand properties and behavior of heat, light, and sound.	Recognize the presence of energy in a variety of forms (i.e., heat, light, sound).	Content VIa. Identify the source of a specified type of energy. Example: When asked where light comes from, identify a possible source (e.g., light bulb, the sun). Student could also identify sources for heat or sound.	Content VIb. Understand that heat, light, and sound are forms of energy. Example: When asked "What is a type of energy?" respond appropriately (e.g., heat, light, sound).	Content VIc. Produce an observable form of energy. Example: Student rings a bell to produce sound energy. Student turns on a flashlight to produce light energy.

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Ia. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: When given the task of determining how liquid water is different from ice, the student performs some tasks on both liquid water and ice to make this determination.	ILO 1 Ib. Follow instructions to conduct a simple investigation (collect data). Example: Observe ice and liquid water (in different containers). Describe the substance in the two containers before and after the ice melts.	ILO 1 Ic. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Observe ice and liquid water (in different containers). Describe the substance in the two containers before and after the ice melts. Conclude that ice and liquid water are both forms of water, so they have some common characteristics.	ILO 1 Id. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: When given the task of determining how particles in warm water move differently from particles in cold water, student determines that he/she needs to vary the temperature of the water and somehow determine how the particles of the water move (e.g., add food coloring). Student conducts the investigation and collects observational data.	ILO 1 Ie. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: When given the task of determining how particles in warm water move differently from particles in cold water, student determines that he/she needs to vary the temperature of the water and somehow determine how the particles of the water move (e.g., add food coloring). Student conducts the investigation and collects observational data. Student concludes that particles in warmer water move more than particles in colder water.

Standard	Elements of	Extended Core—Depth of Understanding				
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Ia. Communicate an observation accurately. Example: Observe ice and liquid water (in different containers). Describe observations.			ILO 4 Ib. Communicate an observation using science language. Example: Observe ice and liquid water (in different containers). Describe observations correctly using the terminology particles or molecules. Include a diagram.	
I. Students will understand the structure of matter.	Understand the molecular arrangement of materials as a solid and a liquid.	Content Ia. Recognize how ice is different from liquid water. Example: Observe ice and liquid water (in different containers). Describe their observations.	Content Ib. Recognize that ice is solid water. Example: Observe ice and liquid water (in different containers). Describe the material in the two containers before and after the ice melts. Example: When given three solid objects (e.g., ball, book, and ice cube), one of which is ice, identify the ice when asked "Where is the water?"	Content Ic. Understand that water can go from solid to liquid and back to solid. Example: When given an ice cube, be able to perform the task, "make it into liquid" and then "make it back into a solid."	Content Id. Understand that matter is made up of smaller things (i.e., molecules or particles) that move. Example: Determine through experimentation that particles in warmer water move more than particles in colder water. Example: Student is given two glass/plastic containers of water. Student drops one drop of food coloring into each container and watches how quickly or slowly the color is distributed within the container. Students then model what was observed on a piece of paper by using the same amount of objects to show the concentration of particles.	Content Ie. Diagram the difference between solid water and liquid water based on molecule arrangement. Example: Divide a paper into two areas, and use the same amount of stickers/other objects to show the concentration of particles. (Stickers/other objects are close together for a solid, farther apart for liquid.)

GRADE 7 STANDARD II

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Student observes how water and rocks respond to different things and conclude that they behave differently.	ILO 1 IIb. Follow instructions to conduct a simple investigation (collect data). Example: Student is given five different objects (some that will float in water and some that will not). Student is directed to drop the objects into water to see if they sink or float. Student records whether the object sinks or floats.	ILO 1 IIc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Student is given five different objects (some that will float in water and some that will not). Student is directed to drop the objects into water to see if they sink or float. Student records whether the object sinks or floats. Based on data, student determines whether objects are more or less dense than water.	ILO 1 IId. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: Student is given five different objects (some that will float in water and some that will not). Student is directed to determine which objects sink or float in water. Student decides how to make this determination and how to collect and record the data.	ILO 1 IIe. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: Student is given five different objects (some that will float in water and some that will not). Student is directed to determine which objects are denser than water and which are less dense than water. Student decides how to make this determination and how to collect and record the data.

GRADE 7 STANDARD II

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIa. Communicate an observation accurately. Example: Draw a living thing as composed of many subunits (e.g., a mosaic of lots of boxes), not simply parts of the whole (e.g., organs as part of the organism).		ILO 4 IIb. Communicate an observation using science language. Example: Draw an environment in which a specified organism would be well suited to survive.	
II. Students will understand the relationship between properties of matter and Earth's structure.	Understand the molecular arrangement of materials as solid and liquid.	Content IIa. Differentiate between natural earth materials and manmade materials. Example: Given pictures of known earth materials (e.g., water, air, and rocks) and pictures of manmade materials (e.g. plastic toy, can of soda), students are able to pick out the known earth materials.	Content IIb. Understand that water and rocks act differently. Example: Student observes how water and rocks respond to different things and conclude that they behave differently.	Content IIc. Identify objects' density relative to water based on whether they sink or float (e.g., apply the rule, if it sinks in water, it is more dense than water; if it floats in water, it is less dense than water. Example: Student drops various objects into water to see if they sink or float (e.g., a can of Diet Coke floats, a can of regular Coke sinks) and concludes the object's density relative to water.	Content IId. Accurately predict an object's density relative to water prior to experimentation. Example: Before students drop each object into a container of water, predict its density relative to water (e.g., whether it will float or sink, and then whether it is more or less dense than water).

GRADE 7 STANDARD III

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIIa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Observe cells (using a microscope, video-scope, or prepared images). Represent the cell as a part of the entire organism.	ILO 1 IIIb. Follow instructions to conduct a simple investigation (collect data). Example: Observe cells (using a microscope, video-scope, or prepared images). Draw (or otherwise represent) what is seen.	ILO 1 IIIc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Observe cells (using a microscope, video-scope, or prepared images). Draw the individual cells and make a prediction of how many cells make up the organism (e.g., a very large number).	ILO 1 IIId. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: Observe cells (using a microscope, video-scope, or prepared images). Draw (or otherwise represent) what is seen. Label the organelles (i.e., cell membrane, cell wall, nucleus and chloroplast) present.

GRADE 7 STANDARD III

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIIa. Communicate an observation accurately. Example: Accurately predict an object's density relative to water, through experimentation (i.e., whether it is more or less dense than water) on various objects.		ILO 4 IIIb. Communicate an observation using science language. Example: Create a representation of materials that are natural earth materials and those that are manmade materials.	
III. Students will understand that the organs in an organism are made of cells that have structures and perform specific life functions.	Understand the basic cellular structure of plants and animals.	Content IIIa. Understand that there are things smaller than we can see that make up living things. Example: Draw a living thing as composed of many subunits (e.g., a mosaic of lots of boxes), not simply parts of the whole (e.g., organs as part of the organism).	Content IIIb. Recognize the term "cell" for things that are smaller than we can see that make up living things. Example: Ascribe the term "cell" to the subunits that make up living things.	Content IIIc. Identify the cell wall, cell membrane, nucleus, and chloroplast in a cell model. Example: When presented with a model or a diagram of a cell, accurately label (can be selected response) the listed parts.	Content IIId. Recognize the gross structural differences (e.g., rigid and green for plant cell) between plant and animal cells. Example: Complete a comparison of plant and animal cells.

GRADE 7 STANDARD IV

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IVa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Observe (can be via pictures) a variety of animals. Describe how they are different from each other.	ILO 1 IVb. Follow instructions to conduct a simple investigation (collect data). Example: Observe (can be via pictures) a variety of environments. Describe how they are different from each other.	ILO 1 IVc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Combine previous observations to describe which environment best suits which organism.	ILO 1 IVd. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: Create (fictionally by drawing or describing) an organism that is suited to survive in a specified environment.
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IVa. Communicate an observation accurately. Example: Observe (can be via pictures) a variety of animals. Describe how they are different from each other.		ILO 4 IVb. Communicate an observation using science language. Example: Draw an environment in which a specified organism would be well suited to survive.	
IV. Students will understand that offspring inherit traits that make them more or less suitable to survive in the environment.	Understand that the traits organisms have help them survive in different types of environments.	Content IVa. Recognize that animals have different traits. Example: When given a picture of an organism, point out the different traits of the organism. (e.g., webbed feet, white fur).	Content IVb. Identify elements of different environments. Example: When given pictures of different types of environments, students are to identify a characteristic of that environment (e.g., deserts are hot, snowy environments are cold).	Content IVc. Understand that the traits organisms have help them survive in different types of environments. Example: When given a picture of an environment, the student can identify a trait that could help an organism survive in that environment.	

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Va. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: When given several like objects, group objects into two categories according to an observable pattern (e.g., smooth/rough shells).	ILO 1 Vb. Follow instructions to conduct a simple investigation (collect data). Example: When given several unlike objects, students group the objects into two categories according to a pattern (e.g., living/non-living objects, things people eat/things people do not eat).	ILO 1 Vc. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: When given several unlike objects, students group the objects into more than two categories according to a pattern (e.g., round, square, triangular, flat, circular, etc.).	ILO 1 Vd. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: With assistance, use a provided classification scheme to classify things.
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Va. Communicate an observation accurately. Example: Identify patterns in like objects that are similar to each other.		ILO 4 Vb. Communicate an observation using science language. Example: Describe what similarities exist between like objects.	
V. Students will understand that structure is used to develop classification systems.	Classify a group of objects into multiple categories.	Content Va. Identify patterns in like objects that are similar to each other. Example: When given several like objects, group objects into two categories according to an observable pattern (e.g., smooth/rough shells).	Content Vb. Identify patterns in objects that look very different from each other. Example: When given several unlike objects, students group objects into two categories according to a pattern. (e.g., living/non-living objects, things people eat/things people do not eat).	Vc. Classify a group of objects into more than two categories. Example: When given several objects that are not alike, students group the objects into more than two categories according to a pattern. (e.g., round, square, triangular; flat, circular, irregular).	

GRADE 8 STANDARD I

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Ia. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Determine that crumpling paper is a physical change by un-crumpling the paper and determining that the paper has not changed from being paper.	ILO 1 Ib. Follow instructions to conduct a simple investigation (collect data). Example: Conduct a series of changes to objects as described in a procedure (e.g., crumple paper, turn a light bulb on and off, fry an egg, rust a nail) and record whether or not the change can be reversed or whether a new material has been formed in a pre-structured chart.	ILO 1 Ic. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Conduct a series of changes to objects as described in a procedure (e.g., crumple paper, turn a light bulb on and off, fry an egg, rust a nail) and record whether or not the change can be reversed or whether a new material has been formed. Record whether the change is chemical or physical in a pre-structured chart.	ILO 1 Id. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conducts the investigation, and collects data. Example: When given the task of determining whether actions bring about a chemical or a physical change, develop a test or way to make this determination, apply these rules to two chemical changes and two physical changes; record information about the change that results (the rule) whether chemical or physical change, without recording the intermediate decision.	ILO 1 I.e. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: When given the task of determining whether actions bring about a chemical or a physical change, develop a test or way to make this determination, apply these rules to two chemical changes and two physical changes, record information about the change that results (the rule), and make the determination of chemical or physical change.

GRADE 8 STANDARD I

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Ia. Communicate an observation accurately. (Aside from doing the actual observation, communicate the observation that a change has occurred.) Example: Draw a flat piece of paper and then draw a crumpled sheet of paper, or describe in words that a raw egg is wet and oozy while a hard-boiled egg is more solid and keeps its shape.	ILO 4 Ib. Communicate an observation using science language. Describe in words that an object that undergoes a physical change is essentially the same thing, but may look different (e.g., flat piece of paper vs. crumpled piece of paper) and that an object that undergoes a chemical change is essentially different (e.g., raw egg vs. hardboiled egg). Example: Describe in words that a raw vs. a cooked egg is different from a flat piece of paper vs. a crumpled piece of paper.	
I. Students will understand the nature of changes in matter.	Identify an object as having undergone a chemical or physical change.	Content Ia. Recognize that a change has occurred, given an object and the same object after a chemical change. Example: Recognize that a fried egg is an egg that has undergone a change.	Content Ib. Recognize that a change has occurred, given an object and the same object after a physical change. Example: Recognize that a cracked egg is an egg that has undergone a change.	Content Ic. Recognize that the two types of changes are different given an object, the object after a physical change has occurred, and the object after a chemical change has occurred. Example: Recognize that there is a difference in the kind of change that has occurred (e.g., cracked vs. fried egg).

GRADE 8 STANDARD II

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Grow two plants for two weeks; one plant gets sunlight, one plant does not.	ILO 1 IIb. Follow instructions to conduct a simple investigation (collect data). Example: Grow two plants for two weeks; one plant gets sunlight, one plant does not. Make sure each plant gets the same amount of water regularly. Determine the difference between the two plants at the end of the experiment.	ILO 1 IIc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Grow two plants for two weeks; one plant gets sunlight, one plant does not. Make sure each plant gets the same amount of water regularly. Determine the difference between the two plants at the end of the experiment and once during the experiment. Answer the question, "Is sunlight important to plants?"	ILO 1 IId. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: When given a task to determine whether plants need sunlight, develop a test or way to make this determination, conduct the process/procedure, and record information that supports the answer to the question, "Is sunlight important to plants?"	ILO 1 IIe. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: When given a task to determine whether plants need sunlight, develop a test or way to make this determination, conduct the process/procedure, record data/observations gathered from the procedure, and use the information to answer to the question, "Is sunlight important to plants?"

GRADE 8 STANDARD II

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIa. Communicate an observation accurately. Example: Describe in words a diagrammatic picture of a food chain in the correct order, or draw a food chain (or find pictures for a food chain) if described in words.			ILO 4 IIb. Communicate an observation using science language. Example: Describe in words a diagrammatic picture of a food chain in the correct order, stating that energy is moving from one level to another and not that one thing eats another.	
II. Students will understand that energy from sunlight is changed to chemical energy in plants and transfers between living organisms, and that changing the environment may alter the amount of energy provided to living organisms.	Trace the flow of energy in food chains.	Content IIa. Understand that energy comes from the sun. Example: Give student cards (sun, mountain, volcano, water); student identifies the sun when prompted ("Where does energy come from?").	Content IIb. Understand that energy for living things comes from the sun. Example: Give student cards sun, mountain, volcano, water), student identifies the sun when prompted ("Where does energy for you come from?").	Content IIc. Understand that energy for living things comes from the sun through plants. Example: Identify plants when prompted ("What helps you get energy from the sun?").	Content IId. Sequence three different objects representing a simple food chain (e.g., sun, plant, rabbit). Example: Given pictures of the sun, grass, cow, and a person, place pictures in correct positions to represent a food chain.	Content IIe. Use arrows correctly to sequence the components of a food chain. Example: Given pictures of the sun, grass, cow, and a person, as well as arrows, place in correct positions to represent a food chain.

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIIa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Given two rock type specimens (with obvious differences in structure) describe how the rocks are different.	ILO 1 IIIb. Follow instructions to conduct a simple investigation (collect data). Example: Given at least ten different rock samples, arrange them into at least two (but no more than four) groups based on stated characteristics (e.g., layers or not, smooth or not, large grain or small grain size).	ILO 1 IIIc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Given at least ten different rock samples, arrange them into at least two (but no more than four) groups based on stated characteristics (e.g., layers or not, smooth or not, large grain or small grain size), answer the question, "What do you know about how the different rocks were formed?" Answer should be, "They were formed different ways."	ILO 1 IIId. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: When given the task of determining which rocks were formed in similar ways, develop a test or way to make this determination, conduct the process/procedure, and record information that supports the answer to the question, "Which rocks were formed in similar ways?"	ILO 1 IIIe. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: When given the task of determining which rocks were formed in similar ways, develop a test or way to make this determination, conduct the process/procedure, and record information that supports the answer to the question, "Why were the rocks in each group formed in similar ways?"

GRADE 8 STANDARD III

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIIa. Communicate an observation accurately. Example: Observe a layered rock and a non-layered rock and relay the observations in diagram form, or in some other way accurately represent layers in one and no layers in another.		ILO 4 IIIb. Communicate an observation using science language. Example: Describe in words how energy moves away from an energy source.	
III. Students will understand the processes of rock and fossil formation.	Demonstrate how deposition of rock materials produces layers of sedimentary rocks over time.	Content IIIa. Recognize that there are patterns in rocks. Example: Group different rocks based on patterns in the rocks (e.g., give student two different layered sedimentary rocks and an igneous rock, and student should be able to sort the two sedimentary rocks based on pattern or layering of rock).	Content IIIb. Identify structure components (i.e., layers) in sedimentary rock. Example: Observe a sedimentary rock (e.g., sandstone, gneiss, schist) and identify that is has layers.	Content IIIc. Demonstrate how layering of rocks occurs. Example: Create a specified pattern in sand art.	Content IIId. Recognize that patterns exist in rocks because of previous events. Example: Present to student a simple clay figure and the same figure compressed; student explains what happened to the first figure to create the second figure.

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IVa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Determine that noise travels in all directions by listening to a bell from five different positions in the room.	ILO 1 IVb. Follow instructions to conduct a simple investigation (collect data). Example: Feel heat from a heat source at four different distances and record relative temperature (hot, cooler and coolest) or measured temperatures.	ILO 1 IVc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Feel heat from a heat source at four different distances and record relative temperature (hot, cooler and coolest) or measured temperatures and conclude that there is less heat at a greater distance from the source.	ILO 1 IVd. Develop a procedure to conduct a simple (independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: If asked to determine how waves change as they move from a source, determine to drop a rock in water and observe something about the waves as they get further from the rock (independent variable is distance from rock and dependent variable is something about the wave).	ILO 1 IVe. Develop a procedure to conduct a simple (independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: If asked to determine how waves change as they move from a source, determine to drop a rock in water and observe something about the waves as they get further from the rock (independent variable is distance from rock and dependent variable is something about the wave) and conclude that the further the waves get from the rock, the further apart they are (and/or the less energy they have).

GRADE 8 STANDARD IV

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IVa. Communicate an observation accurately. Example: Observe the distribution of energy from an energy source and explain observations.		ILO 4 IVb. Communicate an observation using science language. Example: Describe in words how energy moves away from an energy source.	
IV. Students will understand the relationships among energy, force, and motion.	Describe the spread of energy away from an energy-producing source.	Content IVa. Demonstrate ways of generating observable energy. Example: Prompt, "Heat, light, and sound are types of energy; show me one of these types of energy" (e.g., student rings a bell, drops a book, turns on a light, rubs hands together).	Content IVb. Recognize that a person does not have to be in front of a bell to hear it ringing.	Content IVc. Demonstrate that energy moves away from energy sources in all directions. Example: Identifying an energy source and providing five or more arrows, have the student place the arrows to show how the energy always moves from the energy source. Student should place the arrows pointing away from the energy source, but NOT all in one direction.	Content IVd. Demonstrate that the amount of energy decreases as you move away from an energy source. Example: Move away from a heat source to get colder.

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	Not extendable at this time.		
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Ia. Communicate an observation accurately. Example: Model Earth revolving around the sun.	ILO 4 Ib. Communicate an observation using science language. Example: Model and describe the Earth moving around the sun; must correctly use the term *revolving* and identify whatever is holding the modeled Earth in orbit as gravity.	
I. Students will understand the scientific evidence that supports theories that explain how the universe and solar system developed.	Identify the force that allows objects in the solar system to revolve around one another. (Gravity is the force.)	Content Ia. Identify that Earth is revolving around the sun and that the moon is revolving around Earth. Example: When asked, "What revolves around Earth?" student responds with, "The moon." When asked, "What revolves around the sun?" student identifies planets ("stars" is incorrect).	Content Ib. Identify gravity as the force (thing) that causes things to fall. Example: Student correctly states, "gravity" when shown an object falling and is asked, "What force makes the object fall?"	Content Ic. Identify that gravity is the force that keeps Earth in orbit around the sun and the moon in orbit around Earth. Example: Student correctly states, "gravity" when asked, "What keeps Earth in orbit around the sun?" (or the moon in orbit around Earth). This question could be asked while showing a diagram of one of these orbits.

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Explain how something living responds to a change in an abiotic factor. This can be an observation of how a person responds to a colder room, or watching a squirrel gather nuts in the fall.	ILO 1 IIb. Follow instructions to conduct a simple investigation (collect data). Example: Gather two plants of the same age and health. Keep one in sunlight and one in a dark area for two weeks. Observe the health of the plants regularly during the two weeks. Record observations in general terms.	ILO 1 IIc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Gather two plants of the same age and health. Keep one in sunlight and one in a dark area for two weeks. Observe the health of the plants regularly during the two weeks. Record observations in general terms. Conclude that the abiotic factor of light affects the health of the plant.	ILO 1 IId. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: When given the task of determining how abiotic factors affect biotic factors, student determines the biotic factor to study (preferably a plant) and an abiotic factor that affects it (e.g., light, temperature), conducts the investigation, and collects observational data.	ILO 1 IIe. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: When given the task of determining how abiotic factors affect biotic factors, student determines the biotic factor to study (preferably a plant) and an abiotic factor that affects it (e.g., light, temperature), conducts the investigation and collects observational data. Student displays data and constructs an appropriate conclusion about the interaction of the abiotic and biotic factors.

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIa. Communicate an observation accurately. Example: Identify provided example of living things as living and non-living things as not living.		ILO 4 IIb. Communicate an observation using science language. Example: When provided with at least seven objects or representations of objects (some biotic and some abiotic), correctly identify what objects are biotic and which are abiotic.	
II. Students will understand that the features of Earth's evolving environment affect living systems, and that life on Earth is unique in the solar system.	Observe and classify abiotic (non-living) and biotic (living) factors. (Must use terms abiotic and biotic.)	Content IIa. Identify an object (e.g., plant or animal) as biotic or an object (e.g., rock, rain). Example: When shown tangible objects (or representations of the objects), student is able to identify them as either biotic or abiotic.	Content IIb. Identify a factor (e.g., amount of leaves) as biotic or a factor (e.g., temperature, wind) as abiotic. Example: When shown tangible representations of factors (e.g., thermometer), student is able to identify the factors as either biotic or abiotic.	Content IIc. Define biotic as living and abiotic as non-living. Example: Student can accurately define biotic as something living (does not have to be a living factor) and abiotic as something not living (does not have to be a nonliving factor).	Content IId. Recognize examples and non-examples of biotic and abiotic factors. Example: Student is able to sort a list (or representations) of biotic and abiotic factors into biotic and abiotic categories.

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIIa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Determine how convection currents move materials by placing food coloring into heated water. Observe the convection currents and somehow describe the motion.	ILO 1 IIIb. Follow instructions to conduct a simple investigation (collect data). Example: Determine how convection currents move materials (e.g., food coloring, something floating on top of the water) with variation in the temperature of the liquid moving the material. Place food coloring in water at different temperatures (e.g., 20°C, 30°C, 40°C). Collect some form of data (e.g., specific rate or relative rate) about the movement of the material (e.g., food coloring, something floating on top of the water).	ILO 1 IIIc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Determine how convection currents move materials (e.g., food coloring, something floating on top of the water) with variation in the temperature of the liquid moving the material. Place food coloring in water at different temperatures (e.g., 20°C, 30°C, 40°C). Collect some form of data (e.g., specific rate or relative rate) about the movement of the material (e.g., food coloring, something floating on top of the water). Student must use the data to conclude how convection currents cause movement on the surface.	ILO 1 IIId. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: When given the task of determining how convection currents cause motion on the surface, develop a procedure to come to a conclusion, conduct the investigation, and collect some form of data.	ILO 1 IIIe. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: When given the task of determining how convection currents cause motion on the surface, develop a procedure to come to a conclusion, conduct the investigation, and collect some form of data. Student displays data and constructs an appropriate conclusion about how convection currents cause movement on the surface.

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIIa. Communicate an observation accurately. Example: Observe convection currents in water with food coloring added and describe the observation as a circular pattern (arrows or motion do NOT have to be part of description).		ILO 4 IIIb. Communicate an observation using science language. Example: Accurately diagram a convection current using arrows.	
III. Students will understand that gravity, density, and convection move Earth's plates and this movement causes the plates to impact other Earth systems.	Model the movement of materials as a result of convection currents. The student will be able to predict whether the material will rise or sink, based on the temperature of the material. OR the student will be able to predict how surface materials move as a result of convection currents below. (Ex. Food coloring in warm and cold water. Place in room temperature water. The warm water will float and the cold water will sink.)	Content IIIa. Observe the motion caused by convection currents. Example: Observe convection currents in water with food coloring added and describe the observation as a circular pattern (arrows or motion do NOT have been part of description). Student could also observe movement of an object(s) floating on the surface of the water.	Content IIIb. Identify heat as the cause of convection currents. Example: This can be done as a selected response exercise or a constructed response exercise.	Content IIIc. Use arrows to diagram the movement in convection current. Example: Accurately diagram a convection current using arrows. OR place arrows in the correct direction on a convection current. This could be done on the surface as well.	Content IIId. Identify where cold areas and warm areas are on a convection current diagram. Example: Given a convection current, place cold and hot representations in the correct locations or color code the arrows (red for hot going up, blue for cold going down).

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IVa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Explain how water or ice responds to light energy. Conduct a simple investigation to demonstrate what will happen.	ILO 1 IVb. Follow instructions to conduct a simple investigation (collect data). Example: Demonstrate melting or evaporation as a result of light energy when given direction on how to use a directed light source. Observe what happens to the water or ice. Measure the amount of water or ice before being exposed to light energy and after being exposed to light energy.	ILO 1 IVc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Demonstrate melting or evaporation as a result of light energy when given direction on how to use a directed light source. Observe what happens to the water or ice. Measure the amount of water or ice before being exposed to light energy and after being exposed to light energy. Come to the conclusion that the water goes away as a result of the light energy.	ILO 1 IVd. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: When given the task of determining how light energy affects ice or water, develop a procedure to come to a conclusion, conduct the investigation and collect some form of data.	ILO 1 IVe. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: When given the task of determining how light energy affects ice or water, develop a procedure to come to a conclusion, conduct the investigation and collect some form of data. Student displays data and constructs an appropriate conclusion about how light energy affects ice or water.

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IVa. Communicate an observation accurately. Example: When shown pictures of water in various reservoirs of the water cycle (i.e., lake, river, cloud, rain, ocean), be able to identify where the water is.	ILO 4 IVb. Communicate an observation using science language. Example: Observe water evaporating. Accurately represent where the water went.	
IV. Students will understand that water cycles through and between reservoirs in the hydrosphere and affects the other spheres of the Earth system.	Identify the major places in Earth's water cycle where water resides (ex.: clouds, rain, lake).	Content IVa. Identify places where water is in the world. Example: Identify places where water is found (e.g., the tub, a cup, the toilet, a lake, a river). The places do not have to be a specific part of the water cycle.	Content IVb. Identify places in the environment (i.e., not simply household things), where water is found. Example: Identify places in the environment where water is found (e.g., river, clouds, rain, lake, oceans).	Content IVc. Identify the major places (i.e., reservoirs) in Earth's water cycle where water resides. Example: Identify the major places in Earth's water cycle where water resides. The term "water cycle" (in the prompt) is what differentiates this layer of complexity from the previous. Response must include all of the following: clouds, lakes and rivers, oceans.

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	Not extendable at this time.			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Va. Communicate an observation accurately. Example: Identify what matter is found in a picture of an ecosystem. Must identify living and nonliving things, including the water and the air.		ILO 4 Vb. Communicate an observation using science language. Example: Trace the movement of matter (e.g., a molecule) through several (at least three) different paths in a food chain (e.g., it can move from organism to organism, from organism to the air or the ground, it can move from the air into an organism).	
V. Students will understand that Earth's atmosphere interacts with and is altered by the lithosphere, hydrosphere, and biosphere.	Trace the movement of matter through a simple food chain.	Content Va. Understand that in order to grow, people must eat. Example: In response to the prompt, "What do you do in order to grow?" student says, “Eat.”	Content Vb. Understand that in order to grow, all animals must eat. Example: In response to the prompt, "What does a cow do to grow?" student says, “Eat.”	Content Vc. Identify something a primary consumer (e.g., cow, deer, rabbit) might eat and something that a secondary consumer (e.g., tiger, wolf, snake) might eat. The student does not have to know the terms primary and secondary consumer. Example: When asked, (1) “What does a cow eat?” student says “Grass” and (2) “What does a snake eat?” student says “Rats.”	Content Vd. Place the components of a food chain in the correct order. Example: When given the components of a food chain (with at least three parts), place them in the correct order.

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 VIa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: When given two different materials, determine which gets hotter when placed in sunlight. Experiment should involve exposing both materials to the same amount of light (it could be direct sunlight but does not have to be). The experiment does not need to involve anything more than touching both materials after exposure.	ILO 1 VIb. Follow instructions to conduct a simple investigation (collect data). Example: Given two different materials, take the temperature of each before and after at least 30 minutes in direct sunlight. Record the temperature readings in a prepared chart.	ILO 1 VIc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Given two different materials, take the temperature of each before and after at least 30 minutes in direct sunlight. Record the temperature readings in a prepared chart. Based on the data gathered, determine which material got hotter.	ILO 1 VId. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: Develop a procedure to gather data (data can be touch or measured temperature) to determine which of two objects will get hotter when placed in direct sunlight. Conduct the investigation and record the data.	ILO 1 VIe. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: Develop a procedure to gather data (data can be touch or measured temperature) to determine which of two objects will get hotter when placed in direct sunlight. Conduct the investigation and record the data. Determine, based on the data, which material got hotter.

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 VIa. Communicate an observation accurately. Example: Place an object in shade and another of the same object in sunlight. Observe the two objects after 30 minutes. Communicate via two modes (e.g., verbal, written, drawing, with data) that the one in shade is cooler or that the one in the sunlight is hotter.	ILO 4 VIb. Communicate an observation using science language. Example: Communicate via a labeled picture that heat and/or energy comes from the sun.	
VI. Students will understand the source and distribution of energy on Earth and its effects on Earth systems.	Understand that different materials (e.g., metal, water, sand, grass, concrete) absorb heat differently. NOTE: This standard is designed to require that students perform an active investigation. It overlaps learning goals with ILO 1.	Content VIa. Understand that objects in sunlight get hotter than objects in the shade. Example: When given a choice of shade or sunlight, student will identify the sunlight as the place they will get hotter.	Content VIb. Understand that heat comes from the sun. Example: When asked what comes from the sun, student correctly can identify heat.	Content VIc. Understand that objects made from different materials get hotter at different rates when put in sunlight. Example: Based on observation (touching) two objects made of different materials (e.g., sand and metal) or different characteristics (e.g., black and white); student determines that one object gets hotter than another.

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Ia. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Observe (e.g., hear, see, smell, touch) an ecosystem (e.g. classroom, school grounds, shopping mall, wetlands) and identify four living things in the ecosystem and four non-living things in the ecosystem.	ILO 1 Ib. Follow instructions to conduct a simple investigation (collect data). Example: Use specific instruments (for which instruction has been provided) to measure two abiotic characteristics of an ecosystem. (e.g., pH of water, temperature of water, wind speed, wind direction).	ILO 1 Ic. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Use specific instruments (for which instruction has been provided) to measure two abiotic characteristics of ecosystem. Observe at least four biotic factors in a quantifiable manner. Form some conclusion about the relationship or correlation between the abiotic and the biotic factors.	ILO 1 Id. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: When given the task of determining how living organisms interact with other living and nonliving things, student determines the interaction to be studied (e.g., birds and trees, water temperature and animal activity), how the interaction will be studied (can be merely observational), conducts the investigation and collects observational data.	ILO 1 Ie. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: When given the task of determining how living organisms interact with other living and nonliving things, student determines the interaction to be studied (e.g., birds and trees, water temperature and animal activity), how the interaction will be studied (can be merely observational), conducts the investigation and collects observational data. Student displays data and constructs an appropriate conclusion about the observed interaction.

BIOLOGY STANDARD I

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Ia. Communicate an observation accurately. Example: Report, display, or otherwise present observations on an ecosystem which identify four living things and four non-living things.	ILO 4 Ib. Communicate an observation using science language. Example: Report, display, or otherwise present observations on an ecosystem which identify four living things and four non-living things. Presentation must include how the eight things interact with one another.	
I. Students will understand that living organisms interact with one another and their environment.	Understand that living organisms (biotic factors) interact with other living and non-living things (abiotic factors) in the environment.	Content Ia. Identify four living things and four non-living things in an ecosystem that is observed. Example: Observe (e.g., hear, see, smell, touch) an ecosystem (e.g., classroom, school grounds, shopping mall, wetlands) and identify four living things in the ecosystem and four non-living things in the ecosystem.	Content Ib. Identify four interactions (can be in a very minimal sense) among biotic and abiotic factors in an ecosystem. Example: Observe (e.g., hear, see, smell, touch) an ecosystem (e.g., classroom, school grounds, shopping mall, wetlands) and identify four interactions among biotic and abiotic things (e.g., a person using a pencil, a duck floating on water, a student talking to a teacher, birds flying together).	Content Ic. Identify four interactions among biotic and abiotic factors in an ecosystem in a qualitative and quantitative way. Example: Observe (e.g., hear, see, smell, touch) an ecosystem (e.g., classroom, school grounds, shopping mall, wetlands) and identify four interactions among biotic and abiotic things in a qualitative (e.g., it is colder outside on a cloudy day) and quantitative way (e.g., there are more people in that cafeteria than in a classroom, fewer animals are outside when the temperature is above 80°F).

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Observe an action involving water that is a direct result of a property of water and describe what the water is "doing" (in a very general sense). Adjust the demonstration in some way to determine what occurs as a result of the adjustment (e.g., water moving up a paper towel – does the water move faster with more paper towels?).	ILO 1 IIb. Follow instructions to conduct a simple investigation (collect data). Example: Conduct a simple demonstration of a property of water. Collect data related to the demonstration (e.g., how much water can a paper towel hold, how much salt can dissolve in water, does stirring my salt cause it to dissolve in water faster?).	ILO 1 IIc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Conduct a simple demonstration of a property of water. Collect data related to the demonstration (e.g., how much water can a paper towel hold, how much salt can dissolve in water, does stirring my salt dissolve in water faster?). Make a generalized statement related to the data collected (e.g., water moving faster makes stuff dissolve faster, warm water moves faster up a paper towel).	ILO 1 IId. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: When given the task of determining how something affects a specific property of water, student determines what property of water he/she wants to examine, how to affect the property (e.g., temperature for solubility, surface size for adhesion), conducts the investigation and collects data about the interaction.	ILO 1 IIe. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: When given the task of determining how something affects a specific property of water, student determines what property of water he/she wants to examine, how to affect the property (e.g., temperature for solubility, surface size for adhesion), conducts the investigation and collects data about the interaction. Student displays data and constructs an appropriate conclusion about the interaction observed.

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIa. Communicate an observation accurately. Example: Observe an action involving water that is a direct result of a property of water and describe what the water is "doing" (in a very general sense).		ILO 4 IIb. Communicate an observation using science language. Example: Use a property of water to explain observed phenomena involving water.	
II. Students will understand that all organisms are composed of one or more cells that are made of molecules, come from preexisting cells, and perform life functions.	Describe something that happens to water (e.g., water forming a curve, frozen water floating, water moving up a paper towel, water forming a miniscus, water dissolving salt), and explain why it happened, using the properties of water. Student will be exposed to mini-demonstrations with descriptions of the activity.	Content IIa. Observe an action involving water that is a direct result of a property of water and describe what the water is "doing" (in a very general sense). Example: Water expanding when it freezes (observation: the volume got bigger), water moving up a paper towel (observation: the water moves up the paper towel).	Content IIb. Understand that water is made up of many small molecules that cannot be seen, but act in particular ways. Example: Diagram a "magnified" part of water as having a lot of water molecules. Note: the water molecule does NOT have to be modeled as H_2O	Content IIc. Demonstrate a specific property of water. Example: Student correctly completes an appropriate demonstration for a given property of water. The student could do a demonstration and state what property of water the demonstration shows, or complete an appropriate demonstration when asked to demonstrate a specific property of water.	Content IId. Use the property(ies) of water to explain observed phenomena involving water. Example: Student demonstrates adhesion by placing a paper towel in water, showing water moving up the paper towel; identifies this as adhesion; and explains that this happens because the water molecules attract (stick to) the paper towel.

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIIa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Observe a working model of an organ (e.g., a working model of lungs with a diaphragm) or an actual organ or a video involving an actual organ. Explain what is observed.	ILO 1 IIIb. Follow instructions to conduct a simple investigation (collect data). Example: Observe a video involving a working organ system. Explain what is observed. Record how the organs work together to accomplish a task.	ILO 1 IIIc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Observe a video involving a working organ system. Explain what is observed. Record how the organs work together to accomplish a task. Draw a reasonable conclusion about the importance of the organ system to the body.	ILO 1 IIId. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: Design a representation of an organ that can test its basic functioning (e.g., a hollow tube to represent a bone, a balloon to represent a stomach), test the limits of this representation, and report some data related to the experiment.	ILO 1 IIIe. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: Design a representation of an organ that can test its basic functioning (e.g., a hollow tube to represent a bone, a balloon to represent a stomach), test the limits of this representation, and report some data related to the experiment. Student displays the data and constructs a reasonable conclusion about the structural aspect of the organ.

BIOLOG STANDARD III

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIIa. Communicate an observation accurately. Example: Create models of organs from each of the following systems: digestion, respiration, circulation, protection and support, and nervous.		ILO 4 IIIb. Communicate an observation using science language. Example: Create models of organs from each of the following systems: digestion, respiration, circulation, protection and support, and nervous. Also, create a representation/model of the function of each organ.	
III. Students will understand the relationship between structure and function of organs and organ systems.	Describe the structure and function of various organs that are part of the following systems: digestion, respiration, circulation, protection and support, and nervous. Identify an organ and describe its structure and function for a system in at least three of the above systems.	Content IIIa. Identify organs that are part of three of the following systems: digestion, respiration, circulation, protection and support, and nervous. Examples: Digestion—mouth, stomach; respiration—lungs, nose; circulation—heart; protection and support—skull, or any bone (not necessarily by name); nervous—brain.	Content IIIb. Identify organs that are part of three of the main organ systems and each organ's function, in general terms. Examples: Digestion—mouth—helps us chew; respiration—nose—lets air enter us; circulation—heart—moves blood; protection and support—skull—protects the brain, nervous—brain—helps us think.	Content IIIc. Observe organs and/or representations of organs. Describe the structure of the organ. Examples: Bone is hard, stomach is smooth and stretches, heart is made of muscles, and nerves are long.	Content IIId. Observe organs and/or representations of organs. Describe the structure of the organ. Link the structure as observed to the organ's function (in general terms). Examples: The stomach is stretchy like a balloon so it can hold a lot of stuff.

BIOLOGY STANDARD IV

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	Not extendable at this time.		
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IVa. Communicate an observation accurately. Example: When given a pattern with its matching pattern (in a system or variables and matching variables), student is able to determine the rules (or pattern) of matches.	ILO 4 IVb. Communicate an observation using science language. Example: When given a DNA sequence of at least 10 base pairs, student is able to determine the rules of matches (e.g., Adenine to Thymine and Guanine to Cytosine).	
IV. Students will understand that genetic information coded in DNA is passed from parents to offspring by sexual and asexual reproduction. The basic structure of DNA is the same in all living things. Changes in DNA may alter genetic expression.	Apply the basic rule of DNA structure (Adenine to Thymine and Guanine to Cytosine; AT and GC) by using patterns (e.g., letter, color). The basic rule is: A (Adenine) only bonds with T (Thymine), G (Guanine) only bonds with C (Cytosine). When given the rule and a sequence of at least five letters (i.e., nitrogen bases), student will give the matching letters. (Specific purposeful pattern duplication.)	Content IVa. Recreate a pattern involving matching of variables to a counter variable (e.g., blue matches to green and red matches to yellow). Example: Student is given a sequence of green – blue – green – red – yellow – yellow – blue (in any format) and is able to produce the matched sequence (blue – green – blue – yellow – red – red – green).	Content IVb. Recreate a pattern involving matching of variables to counter variables specific to the sequence of DNA (Adenine to Thymine and Guanine to Cytosine). Example: Student is given a sequence of A – T – T – G – A – C and produces the matching sequence of T – A – A – C – T – G.	

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Va. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: When presented with three organisms, two of which are similar (two fish) and one that is not (a dog), identify which organism does not belong. Complete for five different sets of organism.	ILO 1 Vb. Follow instructions to conduct a simple investigation (collect data). Example: When presented with three organisms, two of which are similar (two fish) and one that is not (a dog), identify which organism does not belong. Identify why the two organisms are similar (i.e., which characteristic(s) they share that the other organism does not have). Complete for three different sets of organisms.	ILO 1 Vc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Sort organisms in to two or three groups based on easily identifiable characteristics.	ILO 1 Vd. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: Sort organisms into four groups based on first sorting them into two groups based on a stated characteristic and then each remaining group into two groups based on a stated characteristic.	ILO 1 Ve. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: Complete the previous task (ILO 1 Vd.) and then place an unknown organism into the correct group.

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Va. Communicate an observation accurately. Example: Observe two different organisms. Report which characteristic(s) they have in common (or share) and which are different. Complete for at least three different sets of organisms.	ILO 4 Vb. Communicate an observation using science language. Example: Observe two different organisms. Report which characteristic(s) they have in common (or share) and which are different. When presented with a specific environment (e.g., by picture or other description), identify which organism would live (i.e., survive) better in the environment. The examples can be relatively extreme (e.g., a fish, a horse, and the ocean). .	
V. Students will understand that biological diversity is a result of evolutionary processes.	Create a dichotomous key, based on yes/no, to classify objects. Given a selection of objects, create a dichotomous key by answering "yes" or "no" in response to questions about a characteristic/function/ use of that object. Apply that key to an unknown object.	Content Va. Sort organisms in to two or three groups based on easily identifiable characteristics. Example: Sort a group of animals (when provided with pictures of animals) based on whether the animal has no legs, four legs, or many legs.	Content Vb. Sort organisms into four groups by first sorting them into two groups based on a stated characteristic, and then sorting each remaining group into two groups based on another stated characteristic. Example: Sort a group of plants first into two groups based on being taller or shorter than two feet. Sort the taller group into two groups based on having needles or leaves. Sort the shorter group into two groups based on having flowers or not having flowers.	Content Vc. Complete the previous task (Content Vb.), then place an unknown organism into the correct group.

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Ia. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Student can construct a model of the atom when given the three subatomic molecules.	ILO 1 Ib. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: When tasked to describe the structure of an atom, the student generates the three subatomic particle types and is able to position them relative to one another. Include the term *nucleus* and that the electrons are moving around the nucleus.	ILO 1 Ic. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: Student could accurately relate the scale of an atom via a model or a described model (e.g., if the atom was the size of a football stadium, a clump of grapes on the 50 yard line is the nucleus, while the electrons are spinning around in the rest of the stadium).

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Ia. Communicate an observation accurately. Example: When tasked to describe the structure of an atom, the student generates the three subatomic particle types and is able to position them (or describe their positions) relative to one another.		ILO 4 Ib. Communicate an observation using science language. Example: When tasked to describe the structure of an atom, the student identifies the three subatomic particle types and is able to describe their position relative to one another. Include the term *nucleus* and that the electrons are moving around the nucleus.	
I. Students will understand that all matter in the universe has a common origin and is made of atoms, which have structure and can be systematically arranged on the periodic table.	Relate structure and scale of an atom to the particles that compose it.	Content Ia. When given the three subatomic particles (i.e., neutrons, protons, and electrons), arrange them in their relative positions (i.e., neutrons clustered with protons in the middle and electrons around the outside). Example: Student can construct a model of the atom when given the three subatomic molecules.	Content Ib. Identify the three subatomic particles that comprise an atom. Describe their relative positions to each other. Example: When tasked to describe the structure of an atom, the student generates the three subatomic particle types and is able to position them (or describe their positions) relative to one another.	Content Ic. Describe the structure of an atom. Include the identification of the three subatomic particles, that the neutrons and protons are located in the nucleus and that the electrons are moving around the nucleus. Example: When tasked to describe the structure of an atom, the student generates the three subatomic particle types and is able to position them (or describe their positions) relative to one another. Include the term *nucleus* and that the electrons are moving around the nucleus.	Content Id. Relate structure and scale of an atom to the particles that compose it. Example: Student could accurately relate the scale of an atom via a model or a described model (e.g., if the atom was the size of a football stadium, a clump of grapes on the 50 yard line is the nucleus, while the electrons are spinning around in the rest of the stadium).

Standard	Elements of Standard	Extended Core—Depth of Understanding
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	Not extendable at this time.
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	Not extendable at this time.
II. Students will understand the relationship between energy changes in the atom specific to the movement of electrons between energy levels in an atom resulting in the emission or absorption of quantum energy. They will also understand that the emission of high-energy particles results from nuclear changes and that matter can be converted to energy during nuclear reactions.	Not appropriate for this population.	Not extendable at this time.

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	Not extendable at this time.		
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIIa. Communicate an observation accurately. Example: Relate the positioning of a valence electron without using words (e.g., modeling of some kind).	ILO 4 IIIb. Communicate an observation using science language. Example: Explain why a valence electron is more easily removed from an atom compared to other electrons (e.g., the valence electron is farthest outside; other electrons have more in the way, etc.).	
III. Students will understand chemical bonding and the relationship of the type of bonding to the chemical and physical properties of substances.	Understand what a valence (outermost) electron it is and that it is more easily removed from the atom than other electrons.	Content IIIa. Recognize that there are layers (shells) of electrons orbiting the nucleus. Example: When given a model of a nucleus and more than two electrons, arrange the electrons so that they are not all equal distance from the nucleus (they do not have to be placed in correct orbital arrangements).	Content IIIb. Identify a valence electron, when given a model. Example: Given an illustration of electron shells, identify a valence electron as the one on the outside.	Content IIIc. Recognize a valence electron and that it is more easily removed from an atom than other electrons. Example: Given an illustration of electron shells, identify which electrons are most easily removed from the atom (i.e., the electrons in the outer shell/level) and identify these electrons as valence electrons.

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IVa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Observe a chemical reaction taking place. Describe what is observed.	ILO 1 IVb. Follow instructions to conduct a simple investigation (collect data). Example: Follow simple directions (with guidance) to bring about a chemical reaction.	ILO 1 IVc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Follow simple directions (with guidance) to bring about a chemical reaction. Record observations of the chemical reaction.	ILO 1 IVd. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: Follow simple directions (with guidance) to bring about a chemical reaction. Record observations of the chemical reaction. Record the procedure followed to bring about the chemical reaction.	ILO 1 IVe. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: Follow simple directions (with guidance) to bring about a chemical reaction. Record observations of the chemical reaction. Record the procedure followed to bring about the chemical reaction. Conclude what occurs to bring about a chemical reaction and how to determine whether a chemical reaction occurred.

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IVa. Communicate an observation accurately. Example: Observe a chemical reaction taking place. Describe what is observed.	ILO 4 IVb. Communicate an observation using science language. Example: Observe a chemical reaction taking place. Describe what is observed using appropriate terminology.	
IV. Students will understand that in chemical reactions matter and energy change forms, but the amounts of matter and energy do not change.	Identify evidences of chemical reactions (e.g. odor, color change, gas release). Note: There are chemical reactions that can be observed in a regular classroom (e.g., a match burning, rust forming) and those that need to be observed in an appropriate laboratory (e.g., two liquids forming a precipitate). Either type is acceptable for this essence. Note: Make sure the evidence being observed is actually the result of a chemical reaction (e.g., gas bubbling when a soda is opened is actually a physical change, not a chemical reaction).	Content IVa. Observe a chemical reaction taking place. Describe what is observed.	Content IVb. Identify what would be observed as evidence that a chemical reaction occurred. Example: Either (1) state (or identify from a list) evidences that a chemical reaction has occurred, or (2) when an evidence of a chemical reaction has occurred is observed, identify that a chemical reaction occurred.	Content IVc. Determine (based on observable evidence) whether a chemical reaction occurred or not when two materials are mixed together. Example: Observe two materials being mixed, determine whether or not a chemical reaction occurred, and give appropriate reasoning for the determination.

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Va. Follow instructions to conduct a simple investigation (collect data). Example: Observe a chemical reaction where a factor specific to particle collisions is adjusted. Describe the difference between the two reaction occurrences.	ILO 1 Vb. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Follow simple directions to bring about a chemical reaction and to adjust a factor specific to particle collisions. Describe the difference between the two reaction occurrences.	ILO 1 Vc. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: Conduct an investigation of a chemical reaction where a factor specific to particle collisions is adjusted (can be only two levels of adjustment). Gather data on rate of chemical reaction.	ILO 1 Vd. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: Conduct an investigation of a chemical reaction where a factor specific to particle collisions is adjusted (can be only two levels of adjustment). Gather data on rate of chemical reaction. Explain why the factor affected the reaction rate.

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Va. Communicate an observation accurately. Example: Observe a chemical reaction where a factor specific to particle collisions is adjusted. Describe the difference between the two reaction occurrences.		ILO 4 Vb. Communicate an observation using science language. Example: Explain why a factor specific to particle collisions affects the rate of chemical reaction. Involve impact on particle collisions of the factor.	
V. Students will understand that many factors influence chemical reactions and some reactions can achieve a state of dynamic equilibrium.	Conduct an investigation of the factors specific to particle collisions (e.g., temperature, particle size) that affect the rate of chemical reaction. (This requires the use of a chemistry lab.) Note: Make sure the occurrence being observed and tested is actually the result of a chemical reaction, not simply something with the appearance of a chemical reaction (e.g., dissolving sugar in water is a physical change, not a chemical reaction).	Content Va. Describe and demonstrate how a factor specific to particle collisions could be adjusted. Example: Describe that temperature can be increased by heating a mixture or that particle size can be decreased by breaking materials into smaller pieces.	Content Vb. Observe a chemical reaction where a factor specific to particle collisions is adjusted. Describe the difference between the two reaction occurrences. Example: The difference should be described (can be in general terms) to make it clear that one reaction occurred faster or slower than the other.	Content Vc. Conduct an investigation of a chemical reaction where a factor specific to particle collisions is adjusted (can be only two levels of adjustment). Gather data on rate of chemical reaction.	Content Vd. Explain why a factor specific to particle collisions affects the rate of chemical reaction. Example: This explanation can be as basic as “the stuff is moving faster, so it makes more stuff faster.”

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 VIa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Observe material being dissolved. Student then adjusts the experiment in some way to make the material dissolve faster.	ILO 1 VIb. Follow instructions to conduct a simple investigation (collect data). Example: Student dissolves material in water following a provided procedure. Student continues to follow the procedure, which is designed to adjust a variable that speeds up the rate of dissolution. Student times how long it takes the material to dissolve in most situations.	ILO 1 VIc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Student dissolves material in water following a provided procedure. Student continues to follow procedure, which is the designed to adjust a variable that speeds up the rate of dissolution. Student times how long it takes the material to dissolve in most situations. Student generalizes a way to speed up materials being dissolved based on the experiment.	ILO 1 VId. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: Design and conduct a simple investigation on material dissolving where a factor affecting the process of dissolution is adjusted (can be only two levels of adjustment). Gather data on the rate of dissolution.	ILO 1 VIe. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: Design and conduct a simple investigation on material dissolving where a factor affecting the process of dissolution is adjusted (can be only two levels of adjustment). Gather data on the rate of dissolution. Student generalizes a way to speed up materials being dissolved based on the experiment.

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 VIa. Communicate an observation accurately. Example: Observe material being dissolved where a factor affecting the process of dissolution is adjusted. Describe the difference between the two occurrences of dissolution.		ILO 4 VIb. Communicate an observation using science language. Example: Describe what happens to a material to allow it to be dissolved. Use a diagram or model to support the description.	
VI. Students will understand the properties that describe solutions in terms of concentration, solutes, solvents, and the behavior of acids and bases.	Describe factors affecting the process of dissolving (i.e., temperature, particle size). (Ex.: Drop objects in water and describe what happens. Put salt in two cups of water. Stir one cup of water. Which salt dissolved faster? Put drugs in water.)	Content VIa. Based on observation, describe what is observed when materials dissolve in water. Example: Observe materials dissolving in water and describe that they "disappear."	Content VIb. Observe material being dissolved where a factor affecting the process of dissolution is adjusted. Describe the difference between the two occurrences of dissolution. Example: The difference should be described (in general terms) that one time was faster or slower than the other.	Content VIc. Conduct an investigation on material dissolving where a factor affecting the process of dissolution is adjusted (can be only two levels of adjustment). Gather data on the rate of dissolution. Example: Sugar cubes are used as well as granulated sugar to show that granulated sugar dissolves faster. Data can be time for sugar to "disappear."	Content VId. Explain why a factor affecting the process of dissolution affects the rate of dissolution (how quickly the material dissolves). Example: This explanation can be as basic as “the water can reach more of the material, so it disappears faster.”

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Ia. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Investigate the question, "What makes objects move?" Observe multiple objects moving and relate this to the answer of the question.	ILO 1 Ib. Follow instructions to conduct a simple investigation (collect data). Example: Conduct an investigation that involves a series of demonstrations (some causing objects to move and some causing objects not to move); record observations of what happens to the objects following the specified action.	ILO 1 Ic. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Conduct an investigation that involves a series of demonstrations (some causing objects to move and some causing objects not to move), record observations of what happens to the objects following the specified action. Draw a conclusion about what makes objects move and what causes objects not to move.	ILO 1 Id. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: Design an experiment that involves using at least two forces to make objects both move and not move. Collect data related to the movement of the objects relative to the arrangement of the forces applied.	ILO 1 Ie. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: Design an experiment that involves using at least two forces to make objects both move and not move. Collect data related to the movement of the objects relative to the arrangement of the forces applied. Conclude that net force of zero equals no movement, and any other net force equals movement.

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Ia. Communicate an observation accurately. Example: Observe an object at rest and an object moving. Describe the movement of both objects.			ILO 4 Ib. Communicate an observation using science language. Example: Describe what must happen to make an object move and not move, in terms of force applied.	
I. Students will understand how to measure, calculate, and describe the motion of an object in terms of position, time, velocity, and acceleration.	Describe the motion of an object for which either balanced or unbalanced forces are acting on. (Ex. A car driving is unbalanced. A parked car is balanced.)	Content Ia. Observe an object at rest and an object moving. Describe the movement of both objects. Example: Student observes a ball sitting still and then the ball rolling. Sample description: the ball did not go anywhere and the moving ball was going across the table.	Content Ib. Observe an object at rest and an object moving. Describe the movement of both objects. Example: Student lifts up a book and describes that he/she had to do something to the book to make it move.	Content Ic. Make an object stop moving and describe what was done to make the object stop moving, in terms of force applied. Example: A pendulum is swinging; the student reaches out and touches it, and describes that he/she applied a force to the pendulum to make it stop moving.	Content Id. "Make an object stay at rest." Describe what was done to make the object not move. In terms of force applied. Example: A student is given this task and he/she looks at a pencil sitting on a desk and does nothing to it. He/she describes that he/she applied no force to the pencil. This level of complexity is due to the abstract nature of the task.	Content Ie. Describe what must happen to make an object move, in terms of force applied. Example: Student does not actually make an object move, but simply has to describe that he/she would have to push a toy car so that it moves. This, again, is a level of abstraction.

PHYSICS STANDARD II

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 IIa. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: Investigate which of at least four objects (of measurably different masses) is hardest to move. Order the objects from easiest to hardest to move.	ILO 1 IIb. Follow instructions to conduct a simple investigation (collect data). Example: Given four objects of different masses, use a force-meter to measure how much force is required to move each object. Record the masses and required forces for each object.	ILO 1 IIc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Given four objects of different masses, use a force-meter to measure how much force is required to move each object. Record the masses and required forces for each object. Conclude that the more mass an object has, the more force is required to move it.	ILO 1 IId. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: Design an experiment that adjusts the amount of force applied to an object(s) to determine how objects move differently when different forces are applied to them. Record some form of data for the experiment.	ILO 1 IIe. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: Design an experiment that adjusts the amount of force applied to an object(s) to determine how objects move differently when different forces are applied to them. Record some form of data for the experiment. Conclude that forces of different kinds (e.g., direction amount) affect the movement of objects in different ways.

PHYSICS STANDARD II

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIa. Communicate an observation accurately. Example: Student is asked to move a pencil and a desk. Student is able to communicate that it is harder to move the desk.		ILO 4 IIb. Communicate an observation using science language. Example: Relate the concept of force and mass to the effort required to move an object.	
II. Students will understand the relation between force, mass, and acceleration.	Relate force and mass to the amount of acceleration an object obtains.	Content IIa. Experience that it is harder to move something heavier than lighter. Conclude this from the experience. Example: Student is asked to move a pencil and a desk. Student is able to communicate that it is harder to move the desk.	Content IIb. Experience that an object moved with more effort goes farther than an object moved with less effort. Conclude this from this experience. Example: Student is asked to throw a paper ball. Then the student is asked to throw the same paper ball with more effort. Student is able to communicate that the paper ball thrown with more effort went farther.	Content IIc. Understand that it takes more effort to move a larger object. Example: When told he/she is to be given a task to move a pencil and a desk, student can identify (prior to doing the task) that the desk will require more effort to move.	Content IId. Relate the concept of force and mass to the effort required to move an object. Example: Student is able to relate the relationship involving mass and force (as a combination) to determine which of two situations will require more effort (i.e., acceleration) to move.

Standard	Elements of Standard	Extended Core—Depth of Understanding		
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	Not extendable at this time..		
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IIIa. Communicate an observation accurately. Example: When presented with a scenario where an object falls when dropped, student is able to identify that gravity is the reason why.	ILO 4 IIIb. Communicate an observation using science language. Example: When presented with a scenario where an object falls when dropped, student is able to identify that gravity of both the object and Earth is why the object falls.	
III. Students will understand the factors determining the strength of gravitational and electric forces.	Understand that all objects have gravity. (Example: An object falls to the ground because it has gravity and the Earth has gravity. They are attracted to each other.)	Content IIIa. Apply the concept of gravity in describing why things fall. Example: When presented with a scenario where an object falls when dropped, student is able to identify that gravity is the reason why.	Content IIIb. Know that all things have gravity, an attraction to other objects. Example: When presented with a series of at least ten objects (to include a model/picture of Earth, a model/picture of the sun, a person, and a book), and asked for each object "Does this have gravity?" student correctly says yes to all objects.	Content IIIc. Apply the concept of all objects having gravity in describing why things fall. Example: When presented with a scenario where an object falls when dropped, student is able to identify that the gravity of both the object and Earth is why the object falls.

PHYSICS STANDARD IV

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	Not extendable at this time.			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 IVa. Communicate an observation accurately. Example: When shown an object moving, student identifies the type of energy as kinetic and when shown an object not moving, student identifies the type of energy as potential.		ILO 4 IVb. Communicate an observation using science language. Example: Describe kinetic energy as expending energy and potential energy as possible energy.	
IV. Students will understand transfer and conservation of energy.	Distinguish between kinetic and potential energy. (Potential – possible energy. Kinetic – expending energy.) (Example: A person sitting still could potentially start running – potential energy. The person running is showing kinetic energy.) Use Marble Works.	IVa. Identify an object in motion as having kinetic energy. Example: When shown an object moving and asked what type of energy is being demonstrated, student identifies "kinetic."	IVb. Identify an object at rest as having potential energy. Example: When shown an object not moving and asked what type of energy is being demonstrated, student identifies "potential."	IVc. Demonstrate an object exhibiting kinetic energy and an object exhibiting potential energy. Example: When asked to demonstrate both kinetic and potential energy, student is able to do so (e.g., kinetic as dropping something, potential as a person sitting still).	IVd. Describe kinetic energy as expending energy and potential energy as possible energy.

Standard	Elements of Standard	Extended Core—Depth of Understanding				
ILO 1. Use science process and thinking skills.	Conduct simple investigations.	ILO 1 Va. Conduct a simple investigation to yield an answer to an experimental question that, with very little structure or design to the investigation, nevertheless demonstrates basic scientific thinking. Example: When asked to make some mechanical waves, student is able to demonstrate at least two ways to make mechanical waves (e.g., dropping something in water, making sound, using a string).	ILO 1 Vb. Follow instructions to conduct a simple investigation (collect data). Example: Student sets up a simple wave pool based on instruction. Student produces a wave and records a drawing or other description of the waves.	ILO 1 Vc. Follow instructions to conduct a simple investigation (collect data) and construct a reasonable conclusion. Example: Student sets up a simple wave pool based on instruction. Student produces a wave and records a drawing or other description of the waves. Student adds a barrier in the wave pool off which waves can reflect. Student records a drawing or other description of the original waves and the reflected waves and describes the difference in the two wave patterns.	ILO 1 Vd. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, and collect data. Example: Design an experiment that adjusts the amount of energy provided to a wave. Collect some form of data that results from the change in amount of energy (e.g., size of waves, distance waves travel).	ILO 1 Ve. Develop a procedure to conduct a simple (non-independent variable/dependent variable) experiment, conduct the investigation, collect data, display data, and construct reasonable conclusions. Example: Design an experiment that adjusts the amount of energy provided to a wave. Collect some form of data that results from the change in amount of energy (e.g., size of waves, distance waves travel). Student accurately relays an observable or measurable change in a wave property.

Standard	Elements of Standard	Extended Core—Depth of Understanding			
ILO 4. Communicate effectively using science language and reasoning.	Accurately represent (communicate) an observation (using and senses).	ILO 4 Ia. Communicate an observation accurately. Example: Describe either how waves appear or how a reflected wave is both different from and the same as the original wave.		ILO 4 Ib. Communicate an observation using science language. Example: Describe observed waves, including that energy is transferred.	
V. Students will understand the properties and applications of waves.	Investigate mechanical waves (e.g., dropping a rock in a pond, generating sound).	Content Va. Demonstrate how to make mechanical waves. Example: When asked to make some mechanical waves, student is able to demonstrate at least two ways to make mechanical waves (e.g., dropping something in water, making sound, using a string).	Content Vb. Investigate the reflection of mechanical waves. Example: Observe and report how waves act when reflected (e.g., create waves so that they reflect off an object and report observations).	Content Vc. Understand that energy is transferred through mechanical waves. Example: When asked what is being moved or transferred through a wave, student identifies energy.	Content Vd. Demonstrate how to transfer more energy through a wave. Example: After demonstrating the making of mechanical waves, increase the amount of energy transferred (e.g., dropping a bigger object in water, swinging a rope with more energy).