Ohio’s Learning Standards – Extended with Learning Progressions

Science

August 2019

Ohio | Department of Education

OCALI

Table of Contents

Introduction to Ohio's New Learning Standards - Extended: Science

Overview

In February 2018, the state of Ohio adopted updated Ohio Learning Standards (OLS) for social studies and science. Consequently, Ohio revised the Ohio Learning Standards-Extended (OLS-E) to be aligned with the OLS. The Ohio Department of Education collaborated with teams of educators and experts from around the state to do the work. These committees met multiple times to draft the new extensions. The Department then posted the drafts for public feedback and received hundreds of comments. After the public comment period, the committees considered the comments and implemented suggestions into the final version.

The OLS-E are specific statements of knowledge and skills linked to the expectations in the OLS. The purpose of the extensions is to build a bridge that provides grade level access for students with the most significant cognitive disabilities to the content of the OLS.

The Department developed the OLS-E specifically for students who qualify for and take the Alternate Assessment for Students with Significant Cognitive Disabilities (AASCD). These extensions do not replace the OLS for Science, they are aligned to them. Teachers may use the standards and extensions as a skill or knowledge progression when designing instruction and assessments. Using a standards progression provides flexible access from varied entry points and allows learners with the most significant cognitive disabilities to grow knowledge and skill across a modified curriculum that is linked to the grade-level standards. Educators can then use the link to grade-level targets or outcomes as comparison data in present levels of performance on an IEP. Because instruction and assessment should always consider the full range of extended standards and the links to the grade-level targets and outcomes, the OLS-E development committee designed this document so that the reader can reference the OLS and the extensions on the same page to easily see the progression.

While educators should use the extended standards to provide content that is directly aligned to the OLS for science, they must also meet each child's individual education needs by incorporating other skills as necessary. Teachers should consider incorporating instruction with individual accommodations or supports students need to access the curriculum as well as non-academic skills needed for student success such as communication, self-determination, fine/gross motor, and social/emotional skills. Daily living and life skills are sometimes the same skills presented in the standards as reading, speaking, listening, writing, and economics skills and should be taught and integrated with the extensions. Educational plans should also include any other additional skills necessary for each child's individual education needs and transition planning goals.

Educators can use the OLS-E to differentiate instruction for a wide range of students by using the extensions as entry points to the OLS, but they must do so with caution. Students who do not take Ohio's AASCD will take the general assessments aligned to the general standards. These extensions can provide entry points into the OLS. However, schools must remember that students who do not participate in the AASCD should transition to and will be assessed using the OLS.

Complexity Levels

The committee extended the Ohio Learning Standards to include three levels from "most complex" to "least complex". The complexity levels are comprised of three targets of varying difficulty aligned to each standard from the OLS. The extensions are codified individually for clear designation. The last letter in the extension code indicates the complexity level: "a" denotes the highest level of complexity, "b" denotes the middle complexity level and "c" denotes the lowest complexity level. In some instances, the committee tiered the verb of the extension to increase or decrease the complexity level. In other cases, the concept or skill within the OLS is tiered across the three complexity levels. It is important to move from left to right when reading the extensions. To determine where instruction should begin, educators should start with the general standard and then progress down through the complexity levels until finding the optimum starting point. It's important to note that no one should categorize students according to an extension level. Instead, instruction should build skills across the extensions to the highest level possible based on individual student strengths which may vary across standards. Ideally, when educators apply these extensions within each grade level one should see instruction occurring at all ranges of complexity. When citing standards for lessons and/or assessment design, educators should include the full complexity range, including the general standard. Citing standards in this way acknowledges a range of entry points and a range of learning progress.

*Complex and advanced learning standards in Ohio's New Learning Standards are not included in the extended standards.

Learning Progressions

A learning progression is a sequence of skills linked to a learning target that build base skills and engagement as learners make progress toward mastery of the standard or learning target.

These Learning Progressions are a companion to Ohio's New Learning Standards and OLS-E and help develop teacher and learner clarity about embedded skills within each standard.

Learning progressions are building blocks that can outline how learning builds before, over the course of, and after the target skill.

*It is worth noting that none of the above can be crafted unless the educator has first identified the learning target or standard of focus for the lesson and assessment.

Ohio's Learning Progressions companion document includes the Kindergarten, First and Second grade standards that are not part of Ohio's Learning Standards- Extended. As a reminder, there are no extended standards for grades K-2, however, the learning progressions outline essential skills that are part of each standard.

Together the general standard, extended standards, building base skills and engagement statements make up these sample learning progressions. Learning progressions can be used by education professionals, learners and their families to identify entry level skills, set goals and objectives and track progress over time. Please note: Skills provided in each progression are a sampling of skills leading toward mastery and are not intended to be an all inclusive list. It is possible that other skills may be part of each learning progression and may not all be included in this document.

Skills in the learning progression column are organized in a learning ladder, beginning at the bottom with engagement indicators and moving upward in complexity toward mastery. Some learning progressions may include skills that fall between extended standard complexity levels in addition to building base skills leading to Complexity C. Learning Progressions in grades K-2 include engagement indicators, base skills and a deconstruction of the grade level target.

Learning progressions can be helpful in designing assessments, measuring progress over the course of learning and identifying baseline skills and knowledge. In addition, when used as a data collection tool paired with evidence of student learning, the learning progression may reveal skill gaps and intervention targets. Large segments of missing skills may be considered by intervention and IEP teams as potential goals and objectives that may be targeted to close achievement gaps between the learner and grade-level peers. Thus, leading to individualized IEP development aligned with standards-based data. Data aligned to learning progressions can also be used to articulate present levels by citing skills that the learner has demonstrated leading up to a skill gap, also known as present levels of performance.

Learning progressions help education professionals maintain age/grade-level alignment for each learner while still addressing both strengths and needs. No matter where the entry point, all learners can demonstrate skills leading to grade-level outcomes. Seeing each and every learner as part of the learning continuum at grade-level is the goal. Learning progressions help make that goal a reality for all learners and all teaching professionals.

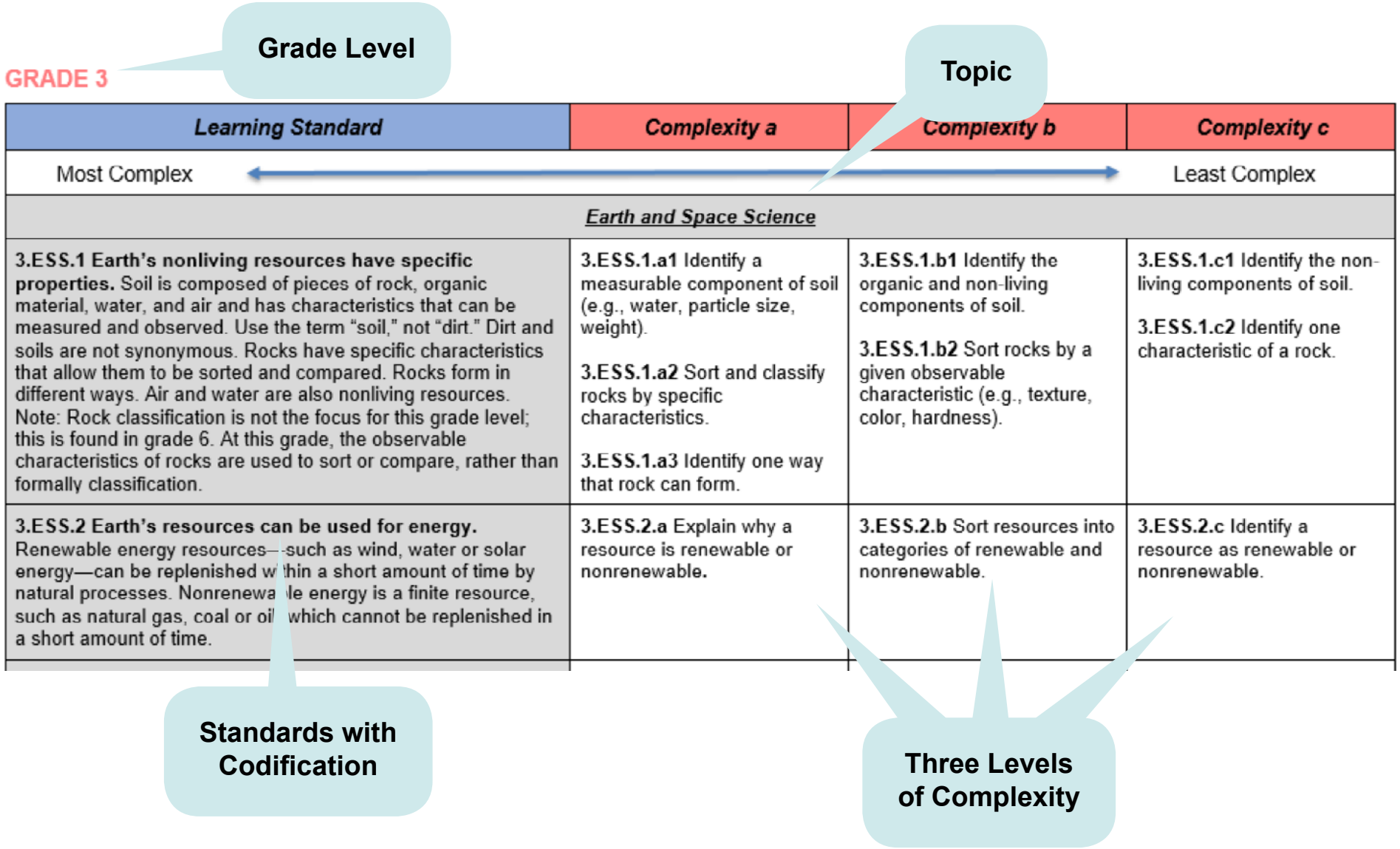
Please note: This resource provides many, but not all skills leading to and through Ohio's Learning Standards and OLS-E. The OLS-E with Learning Progressions is a living document. Review and refinement of these LP's is ongoing and the documents will be updated regularly. Please check in frequently for the most up to date version.

Accessibility

The OLS-E and the Learning Progressions do not specify individual accommodations or supports that may be necessary for students to access the curriculum. Teachers should consider the unique learning needs of each student and integrate the Individualized Education Plan (IEP) designated supports and services when designing lessons. It is imperative that teachers provide specially designed instruction, assistive technology, accommodations and other supports needed to ensure full access to learning opportunities so that students can demonstrate their full range of knowledge and skills.

Navigating the Ohio Learning Standard Extensions

The graphic illustrates the components of the Extensions:



Navigating the Learning Progressions

The graphic illustrates the components of the Learning Progression:

Building Base Skills

Learning Standard	Complexity a	Complexity b	Complexity c	Learning Progression *Building the Base & Engagement*
Most Complex ⟵				⟶ Least Complex
3.LS.2 Individuals of the same kind of organism differ in their inherited traits. These differenc give some individuals an advantage in surviving and/or reproducing. Plants and animals have physical features that are associated with the environments where they live. Plants and anima have certain physical or behavioral characteristics that influence their chances of surviving in particular environments. Note: The focus is on the individual, not the population. Adaption is not the focus at this grade level.	within a species would be an advantage in a given environment.	select the one variation that will be an advantage to the organism.	**3.LS.2.c1** Identify that there is variation within the same species. traits in an individual organism that would help it be successful in its environment.	• Explain why a particular trait is advantageous in a given environment. • Identify traits as advantageous in certain environments. • Describe the traits of an organism that help it live in its environment (e.g., thick covering on cactus, thick fur on Arctic animals, the ability to camouflage, fast running speed of predators, ability to climb). • Identify that variat ons in traits may provide a survival advanta ge. • Match organisms nd the environment in which they are fo nd (e.g., fish in water, deer in forest). • Using pictures o ctual organisms identify differences amo traits in members of the same species (e litter of puppies have different colorat or fur texture).
3.LS.3 Plants and animals have life cycles th adaptation natural env organisms a dying, and the life cycle organisms, to survive a natural envi names of th cycles are n	**3.LS.3.a** Describe	**3.LS.3.b** Match an life cycle nment.	**3.LS.3.c** Identify the main stages of an organism's life cycle: birth, growth, adulthood, reproduction, and death.	watch nature videos that trace the life

This learning progression includes the general standard, 3 extended standards and base skills beginning with engagement

Is important to note that each standard and extended standard are made up of many individual points of learning (knowledge and skills). All of these skills can be developed and monitored with explicit instruction and assessment.

Skills grow from engagement and base skills (at the bottom) to and sometimes through the extended standards (moving upward like a learning ladder)

Learning Progressions for Science, Grades K – 2

Kindergarten

Grade-Level Standard Kindergarten	**Learning Progression** ***Building the Base & Engagement***
Earth and Space Science	
K.ESS.1 Weather changes are long term and short term.	• Know that wind is moving air. • Describe that the Earth is surrounded by air. • Map weather patterns for a month recording precipitation and temperature. Was it windy? Did it rain today? Was it hot or cold? Do I need a sweater to go outside? Do I need an umbrella? • Identify seasons that occur in children's literature. • List the characteristics of the weather for each season. In summer it is hot and sometimes rainy. The sun is out a long time. In spring it is really rainy. In fall, the leaves change color and fall off the trees. In the winter there can be snow and ice. • Relate holidays to the seasons when they occur (e.g., Christmas in winter, Fourth of July in summer). • Relate activities to the different seasons (e.g., planting flowers in the spring, swimming in the summer, picking apples in the fall, sledding in the winter) • Identify what happens before it storms (e.g., sky gets dark, temperature drops, wind increases). • Describe what constitutes a rainy day ane note the characteristics (cloudy, dark or gray skies, lots of precipitation, little sunshine). • Describe what constitutes a sunny day and note the characteristics (blue sky, no rain, sunshine). • Recognize when wind is blowing. Recognize the effects of wind (leaves rustling, branches blowing down, flag waving).

Grade-Level Standard Kindergarten	**Learning Progression** ***Building the Base & Engagement***
K.ESS.2 The moon, sun and stars can be observed at different times of the day or night.	• Use media to illustrate the motion of the sun and the stars over a period of time. • Record and describe when and where you see the moon for a month. Note that the moon can sometimes be seen during the day. • Describe that the pattern of stars looks different at different times of the night and in different seasons. • Describe that the moon appears in different places in the sky at different times. • Describe that the moon looks different on different nights (e.g., crescent, full moon, half moon) • Identify pictures (can be from children's literature) that show various times of day (e.g., lunchtime, bedtime). • Track the sun across the sky during a day noticing how its position changes. Recognize that the sun is highest in the sky in the middle of the day. • Record what can be seen in the daytime sky (sun, sometimes the moon) and the nighttime sky (stars, sometimes the moon). • Identify pictures that show nighttime and daytime. • Describe what is daytime (light) and what is nighttime (dark).
Life Science	
K.LS.1 Living things have specific characteristics and traits.	• Recognize that all living things grow, reproduce, require energy, respond to stimuli. • Describe how a plant responds to a stimulus (e.g., bends toward light, loses leaves in the fall) • Describe how an animal responds to a stimulus (e.g., a fish in an aquarium responds to food, a dog comes when called). • Recognize that living things come from other living things (e.g., seeds grow new plants, eggs hatch, cats have baby kittens). • Describe that plants and animals grow during their lifetime (change from seedlings to mature plants or babies to adult animals). • Recognize plants need light to grow. • Recognize that animals need to eat to stay alive. • Name some plants that are in the school or home environment (e.g., grass, tree, flowers). • Name some animals that are in the school or home environment (e.g., dog, cat, worm, insects, fish).

Grade-Level Standard Kindergarten	**Learning Progression** ***Building the Base & Engagement***
K.LS.2 Living things have physical traits and behaviors, which influence their survival.	• Compare physical traits and characteristics of various living things. • Identify specific traits and characteristics of a given set of living things. • Determine how various physical traits and characteristics of living things help them to survive. • Identify physical traits that help living things to perform various functions (e.g., birds have wings so they can fly, dogs have fur to keep them warm, trees have trunks to support their branches, plants have roots to get water). • Observe physical traits and characteristics of various living things.
Physical Science	
K.PS.1 Objects and materials can be sorted and described by their properties	• Track the measurement of something over time (height of a plant, temperature over the school year) in standard or nonstandard units, display the data in a chart or graph. • Use nonstandard units to measure (marks on a dowel to measure the depth of snow, number of paperclips to balance an object, number of straws wide the table is). • Describe which attribute would be most appropriate to use to compare a given set of objects. • Recognize that there is more than one way to sort the same group of object. • Compare two objects using a property (this one is heavier, this one is hotter, this one is rougher, this one is more flexible). This could include objects under a magnifying glass. • Dictate or write a description of an object including as many attributes as possible. • Handle a variety of materials to compare their textures and flexibilities (cotton, wool, wood, bark, clay, metal, glass). • Use a magnifying glass to look at details of objects, describe what is seen. • Smell a variety of substances that have detectable odors (perfume, flowers, lemons, pine needles, vanilla) describe the smells, recognize that smells vary and that smell can help identify a substance. • Given a set of objects arrange them from largest to smallest. • Compare the temperature of two cups of water (cool, warm) by touching with a finger. • Given a group of objects sort them by shape. • Given a group of objects sort them by color. • Given two objects choose the larger one.

Grade-Level Standard ***Kindergarten***	**Learning Progression** ***Building the Base & Engagement***
K.PS.2 Some objects and materials can be made to vibrate to produce sound.	• Suggest adjustments to make the instruments change pitch, try the adjustments, report/record results. • Construct homemade instruments. • Recognize that vibrations are associated with sound (e.g., watch rice on the surface of a drum, watch video of a vibrating string on an instrument, hit a cymbal or triangle and place it in a bowl of still water). • Listen to sounds, predict whether they were made by tapping, blowing or plucking. • Blow on a whistle, wind instrument, or bottle, compare the sounds. • Pluck different lengths of the same material, compare the sounds (higher, lower). • Listen to sounds, describe them has high or low. • Pluck a rubber band and a guitar string and describe the sounds. • Describe what happens if you tap harder (gets louder). • Tap on a variety of objects (or listen while they are tapped), describe the different sounds made.

Grade 1

Grade-Level Standard ***Grade 1***	**Learning Progression** ***Building the Base & Engagement***
	Earth and Space Science
1.ESS.1 The sun is the principal source of energy.	• Recognize that it takes time for hot things to cool down. • Recognize that the longer something is in the sun the warmer it becomes (monitor air temperature morning, noon, afternoon on a sunny day or monitor the temperature of a glass of water in the sun). • Recognize that at night, it is dark and usually cooler because the sun is not visible. • Recognize that when the sun is visible, there is light and it is usually warmer than night. • Feel the sun on your face and describe the experience (warm).
1.ESS.2 Water on Earth is present in many forms.	• Watch time lapse videos of how water changes the shape of the land (e.g., Grand Canyon, stream erosion) and describe the changes observed. • Describe what happens to the dirt as rain falls on it (set up a mound of dirt and simulate rainfall or observe erosion in the schoolyard). • Watch water freeze and melt. Compare the physical properties before and after melting (e.g., temperature, weight, texture). • Identify places in nature where you can find solid (snowflakes, glaciers, hail) and liquid (rain, rivers) water. • Observe snowflakes under a magnifying glass and describe how their shapes vary. • Identify various forms of water (snow, rain, sleet, fog, dew) in media. • Relate water to precipitation in weather (rain, snow, sleet). • Recognize that fog is a cloud close to the ground. • Recognize that clouds are made of water. • Identify pictures of various locations of water (lakes, ponds, streams, oceans, dew on grass).

Grade-Level Standard ***Grade 1***	**Learning Progression** ***Building the Base & Engagement***
Life Science	
1.LS.1 Living things have basic needs, which are met by obtaining materials from the physical environment.	• Match organisms to environments that will meet their basic needs. • Recognize that every living thing has basic needs (food/energy, water and temperature). • Recognize that plants and animals require water from the environment. • Recognize that animals require certain temperatures to survive (e.g., have feathers/fur, can only live in certain climates, or need homes, nests or dens). • Recognize that plants require certain temperatures to grow. • Recognize that plants get energy from sunlight. • Recognize that animals get energy from food. • Name some examples of human basic needs (e.g., food, water, shelter).
1.LS.2 Living things survive only in environments that meet their needs.	• Recognize that seasonal changes in environments affect survival of living things (more living things die during winter when food and warmth are scarce). • Describe how seasonal changes affect living things (e.g., in winter trees lose leaves, birds fly south and some animals hibernate). • Recognize that different environments support different living things. • Describe differences in environments (e.g. desert is hot and dry, forest is shady and has rainfall). • Describe how an environment can provide shelter and protection to living things (e.g., trees to build nests, places to hide from predators, shade from hot sun). • Identify different types of shelter (e.g., nest, cave, den, burrow, house).

Grade-Level Standard ***Grade 1***	**Learning Progression** ***Building the Base & Engagement***
	Physical Science
1.PS.1 Properties of objects and materials can change.	• Design a way to keep your crayons from melting outside in the hot sun. • Know that all things can melt but some need to be at higher temperatures than we have at a school (e.g., see what happens when you try to melt objects with higher melting points (metal, glass), watch a video of glass blowing or metal in a blast furnace.) • Identify common substances that can melt at low temperatures (e.g., chocolate, butter, crayons). • Identify how an object changes when it is melted and refrozen (e.g., put an ice cube in a baggie, let it melt, then refreeze it, describe ways the new ice is different from the original ice cube). • Recognize that the mass of water before and after melting or freezing is the same. • Predict what would be needed to turn the water back into ice. • Predict ways to melt an ice cube more quickly (shine light on it, put it in the sun, heat it in a pan). • Describe what happens to water when you add or subtract heat from it (temperature changes, freezes into ice). • Describe how the properties of water change as it melts from ice to liquid water. • Identify whether a substance is a solid or a liquid.
1.PS.2 Objects can be moved in a variety of ways, such as straight, zigzag, circular and back and forth.	• Identify what is pushing or pulling on moving objects in the environment (leaves rustling, cars passing, a flag waving). • Show a way to apply a force (push or pull) to make a moving object turn in a new direction (blow on a floating bubble, kick a rolling soccer ball). • Identify a push or pull as a force. • List as many ways as possible to push or pull (blowing, kicking, tugging on a rope). • Describe what happens if you push or pull harder on an object. • Describe what happens when you push or pull an object. • Describe the motion of common objects (a swing, a hoola hoop, a soccer ball). • Demonstrate, describe or identify different ways to move objects, such as straight, zigzag, in a circle. • Recognize that moving things are changing their location (position). • Categorize things as moving or standing still, discuss what is different about things that are moving and things that are standing still. • Recognize that you cannot tell the location of something without comparing it to something else (in my backpack, behind the tree).

Grade 2

Grade-Level Standard ***Grade 2***	**Learning Progression** ***Building the Base & Engagement***
Earth and Space Science	
2.ESS.1 The atmosphere is primarily made up of air.	• Identify landforms found on Earth that have been affected by wind (e.g. sand dune, rock formations, worn down statue). • Demonstrate that wind can impact Earth's landforms (e.g., build a pile of sand and use a fan to simulate wind). Record changes observed. • Recognize that air movement can result in violent storms (e.g., hurricanes, tornadoes, thunderstorms). • Recognize the relationship between temperature changes and wind (e.g., monitor weather conditions and track how temperature changes impact wind). • Identify that wind movement can change (e.g., measure the direction and speed of wind outside on different days). • Identify that changes in air temperature create wind. • Recognize that air has mass (e.g., compare the mass of a balloon with and without air by hanging on two ends of a ruler). • Recognize that air takes up space (e.g., compare a balloon with and without air). • Use a simple instrument (e.g., pinwheel, windsock, flag, wind chimes) to measure the relative speed of wind). • Recognize that wind blows at different speeds.
2.ESS.2 Water is present in the atmosphere.	• Collect data on weather conditions in the school yard, chart and compare data and discuss the relationships between temperature, cloud cover and precipitation. • Recognize that different types of clouds cause different weather. • Recognize that water vapor in the air can condense to form clouds, fog, or dew (e.g., observe condensation on the outside of a cold beverage). • Recognize that temperature can affect how quickly water evaporates (e.g., compare dishes of water inside the classroom and in the hot sun). • Recognize that water can evaporate (e.g., place water in a dish and put it in a sunny window). • Recognize that clouds are moved by wind. • Identify water in its many forms and relate to weather (rain, sleet, hail, snow, fog).

Grade-Level Standard ***Grade 2***	**Learning Progression** ***Building the Base & Engagement***
2.ESS.3 Long and short term weather changes occur due to changes in energy.	• Recognize that different parts of Earth heat up at different rates (e.g., investigate the warming of land, water and air by using a sunlamp to heat equal containers of water, soil and air). • Compare the number of daylight hours to the temperature (the higher number of daylight hours usually means warmer temperature; the lower number of daylight hours usually means cooler temperatures). • Use weather data (temperature, wind speed and direction, air pressure) to explain changes before, during and after a storm . • Track the temperature during the change seasons and note the increase or decrease of temperature and how it impacts the weather (cooling in the fall transitioning into winter, warming in the spring transitioning to summer). • Recognize that some types of severe weather occur only in certain regions (e.g., Ohio will not be directly hit by a hurricane). • Recognize that some weather changes happen quickly and some are more long term. • Give examples of energy changes affecting the environment (e.g., the sidewalk gets hot in the sun, a sailboat moves with the wind)
Life Science	
2.LS.1 Living things cause changes on Earth.	• Document the effect on an environment caused by a living thing (e.g., humans not recycling, worms composting). • Given images or video of changes to an environment, determine if the change was fast or slow. • Sort changes in an environment by whether they were caused by living or non living things. • Identify a change to an environment that was caused by a living thing. • Choose from a set of pictures the ones that show changes human have made to the environment (e.g., making a road cut, factory polluting, mining, trash on ground, construction). • Sort pictures into before and after (e.g., sidewalk with and without cracks with weeds, stream with and without a beaver dam, ground with and without an ant hill, lake without and with algal bloom).

Grade-Level Standard ***Grade 2***	**Learning Progression** ***Building the Base & Engagement***
2.LS.2 Some kinds of organisms become extinct when their basic needs are no longer met or the environment changes.	• Understand that organisms alive today sometime resemble extinct organisms (e.g., use pictures or media to compare and contrast organisms alive today and extinct organisms). • Identify some common types of fossil imprints (e.g., tracks, molds, casts). • Identify some common types of fossil remains (e.g., shells, bones, scat, eggs). • Recognize that fossils are the remains of animals that once lived. • Identify some types of organisms that lived in the past no longer exist (e.g. Saber tooth cat, trilobite, Dodo bird, sigillaria tree). • Recognize that changes in environments affect survival of living things. • Describe ways that environments can change. • Describe how environments provide materials and resources that relate to various basic needs. • Recognize that basic needs include food/energy, water and temperature.
Physical Science	
2.PS.1 Forces change the motion of an object.	• Show that other noncontact forces (forces that can pull or push without touching the object) can change motion by demonstrating with magnets and static electricity (balloons rubbed on hair). Magnetic and static forces can both pull and push. • Identify the force that makes things fall as gravity, notice that gravity works without touching the object. Gravitational force only pulls. • Recognize that all objects fall to the ground when dropped. • Demonstrate a variety of changes to motion (e.g., make something stop moving, make something start moving, make something speed up or slow down, make something change its direction). • Describe how different size forces change motion (e.g., kick a ball lightly then kick it harder). • Identify that a pull or a push is called a force. • Identify examples of pulls and pushes (e.g., wind blowing, pulling a wagon, tossing a beanbag). • Note: The first grade PS.2 learning progression can be a precursor to this standard for those students who need an early point of entry.

Extended Standards with Learning Progressions for Science, Grades 3 - 8

Grade 3

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
Most Complex ←				→ Least Complex
Earth and Space Science				
3.ESS.1 Earth's nonliving resources have specific properties. Soil is composed of pieces of rock, organic material, water, and air and has characteristics that can be measured and observed. Use the term "soil," not "dirt." Dirt and soils are not synonymous. Rocks have specific characteristics that allow them to be sorted and compared. Rocks form in different ways. Air and water are also nonliving resources. Note: Rock classification is not the focus for this grade level; this is found in grade 6. At this grade, the observable characteristics of rocks are used to sort or compare, rather than formally classification.	**3.ESS.1.a1** Identify a measurable component of soil (e.g., water, particle size, weight). **3.ESS.1.a2** Sort and classify rocks by specific characteristics. **3.ESS.1.a3** Identify one way that rock can form.	**3.ESS.1.b1** Identify the organic and non-living components of soil. **3.ESS.1.b2** Sort rocks by a given observable characteristic (e.g., texture, color, hardness).	**3.ESS.1.c1** Identify the non-living components of soil. **3.ESS.1.c2** Identify one characteristic of a rock.	• Recognize that different types of rocks are formed in different ways. • Compare the rate water passes through samples of different rocks and soils. • Describe the similarities and differences between two rocks. • Sort a group of rocks by a given characteristic. • List the things that make up soil (e.g., pieces of rock, organic material, water, air). • Identify characteristics of different soil samples (e.g., texture, color, moisture). • Identify characteristics of rocks (e.g., color, texture, crystal size). • Note: Properties of materials were introduced in K.PS.1.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
3.ESS.2 Earth's resources can be used for energy. Renewable energy resources—such as wind, water or solar energy—can be replenished within a short amount of time by natural processes. Nonrenewable energy is a finite resource, such as natural gas, coal or oil, which cannot be replenished in a short amount of time.	**3.ESS.2.a** Explain why a resource is renewable or nonrenewable.	**3.ESS.2.b** Sort resources into categories of renewable and nonrenewable.	**3.ESS.2.c** Identify a resource as renewable or nonrenewable.	• Given a resource explain why it is renewable or nonrenewable. • Explain how nonrenewable resources work to produce energy (e.g., coal engine on a train, natural gas in a stove). • Explain how renewable resources work to produce energy (e.g., wind turbine using wind, solar panels, Niagara Falls producing hydroelectricity). • Categorize resources as renewable or nonrenewable. • Identify a variety of nonrenewable energy resources using children's literature or media. • Identify a variety of renewable energy resources using children's literature or media.
3.ESS.3 Some of Earth's resources are limited. Some of Earth's resources become limited due to overuse and/ or contamination. Reducing resource use, decreasing waste and/or pollution, recycling, and reusing can help conserve these resources.	**3.ESS.3.a** Explain a way to conserve a given resource.	**3.ESS.3.b** Match a limited resource to a means to conserve it (e.g., fresh water can be conserved by taking short showers).	**3.ESS.3.c** Identify a way to conserve a given resource.	• Compare data on two means of conservation and choose the more effective. • Explain a way to conserve a given resource. • Sort behaviors as contributions to conservation or wasteful efforts. • State one way to conserve a given resource. • Classify behaviors as being conservative or wasteful (e.g., only taking as many paper towels as you actually need). • Identify behaviors as being conservative or wasteful (e.g., water running while brushing teeth or turning it off).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Life Science		
3.LS.1 Offspring resemble their parents and each other. Individual organisms inherit many traits from their parents indicating a reliable way to transfer information from one generation to the next. Some behavioral traits are learned through interactions with the environment and are not inherited.	**3.LS.1.a1** Explain why you can expect the offspring to have similar physical traits to the parent. **3.LS.1.a2** Explain why a given trait is learned behavior or an inherited. **3.LS.1.a3** Explain how a change in an environment can affect a behavior of an organism in that environment.	**3.LS.1.b1** Identify similar inherited physical traits that can be observed in a parent and offspring. **3.LS.1.b2** Sort a set of given traits as either learned behaviors or inherited physical traits. **3.LS.1.b3** Match an environmental change to a potential behavioral change of an organism.	**3.LS.1.c1** Identify one observable way an offspring resembles a parent. **3.LS.c2** Identify a trait as either a learned behavior or an inherited physical trait. **3.LS.1.c3** Given an environmental change, identify a behavioral change that would help an organism in that environment.	• Describe how changes in the environment affect the behavior of organisms (e.g., raccoons eating from trash cans, squirrels hiding nuts, animals hibernating). • Explain how learned behaviors help an organism survive (e.g., birds leaving the nest, mother lion teaching cub to hunt, cubs playing). • Classify a set of traits as learned or inherited. • Give examples of behaviors that are not inherited but are learned after birth (e.g., a bird learning to fly, children learning to read, a lion learning to hunt). • Know that some traits are inherited and some are learned. • Explain that information that determines physical and behavior traits is passed on from one generation to the next. • Describe the growth of a organism from birth to adulthood and note the changes (e.g., watch a nesting webcam, plant seedlings). • Describe similarities and differences in the appearance of parents and offspring (e.g., dogs and puppies have fur but puppy fur is softer). • Match offspring to parents.Recognize that offspring look like parents (e.g., kittens look like cats, small trees look like bigger trees, children and adults have the same body parts).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
3.LS.2 Individuals of the same kind of organism differ in their inherited traits. These differences give some individuals an advantage in surviving and/or reproducing. Plants and animals have physical features that are associated with the environments where they live. Plants and animals have certain physical or behavioral characteristics that influence their chances of surviving in particular environments. Note: The focus is on the individual, not the population. Adaption is not the focus at this grade level.	**3.LS.2.a1** Describe how a variation in a physical or behavioral trait would give an individual an advantage. **3.LS.2.a2** Explain why one physical or behavioral trait within a species would be an advantage in a given environment.	**3.LS.2.b1** Identify variations in physical and behavioral traits within the same species. **3.LS.2.b2** When given an environment and given variations of the same organism, select the one variation that will be an advantage to the organism.	**3.LS.2.c1** Identify that there is variation within the same species. **3.LS.2.c2** Identify traits in an individual organism that would help it be successful in its environment.	• Explain why a particular trait is advantageous in a given environment. • Identify traits as advantageous in certain environments. • Describe the traits of an organism that help it live in its environment (e.g., thick covering on cactus, thick fur on Arctic animals, the ability to camouflage, fast running speed of predators, ability to climb). • Identify that variations in traits may provide a survival advantage. • Match organisms and the environment in which they are found (e.g., fish in water, deer in forest). • Using pictures or actual organisms identify differences among traits in members of the same species (e.g., litter of puppies have different coloration or fur texture).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
3.LS.3 Plants and animals have life cycles that are part of their adaptations for survival in their natural environments. Worldwide, organisms are growing, reproducing, dying, and decaying. The details of the life cycle are different for different organisms, which affects their ability to survive and reproduce in their natural environments. Note: The names of the stages within the life cycles are not the focus.	**3.LS.3.a** Describe how a specific environment supports a specific organism's life cycle (e.g., flowering plants do not flower outside in the winter).	**3.LS.3.b** Match an organism's life cycle to an environment.	**3.LS.3.c** Identify the main stages of an organism's life cycle: birth, growth, adulthood, reproduction, and death.	• Recognize that different organisms may have different life stages (e.g., metamorphosis). • Match stage of the life cycle to what is going on in the environment (e.g., many babies are born in the spring when food is plentiful, seeds germinate when the soil is moist). • Know that an individual organism may die at any point in the life cycle. • Identify different stages of a life cycle (e.g., watch nature videos that trace the life cycles of a variety of organisms, observe mealworms in the classroom). • Recognize that organisms are born/germinate, grow, reproduce, die and decay.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Physical Science		
3.PS.1 All objects and substances in the natural world are composed of matter. Matter takes up space and has mass. Differentiating between mass and weight is not necessary at this grade level.	**3.PS.1.a** Using non-traditional measurements, measure the volume of different objects, and using metric or non-traditional measurements, measure the mass of different objects.	**3.PS.1.b** Using non-traditional measurement, units (e.g., paper clips, cubes), identify the volume or mass of an object.	**3.PS.1.c** Identify one or more characteristics of matter (takes up space and has mass).	• Compare objects of the same size and shape that have different masses (e.g., by finding their mass or by lifting to see which is heavier). • Compare the volume of two containers (e.g., which holds more pieces of popcorn, which holds more milliliters of water). • Recognize that all matter (solids, liquids, gases) has mass and volume. Note: Air having mass and volume was explored in 2.ESS.1. • Measure mass using SI units (e.g., using a balance). • Measure mass using nonstandard units (e.g., paperclips, washers, marbles). • Recognize that mass is the amount of material in an object or substance. • Measure volume using SI units (e.g., unit cubes, milliliters). • Measure volume using nonstandard units (e.g., cubes, marbles).Recognize that volume is the amount of space taken up by an object or substance.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
3.PS.2 Matter exists in different states, each of which has different properties. The most recognizable states of matter are solids, liquids, and gases. Shape and compressibility are properties that can distinguish between the states of matter. One way to change matter from one state to another is by heating or cooling.	**3.PS.2.a1** Match a given property to its state of matter. **3.PS.2.a2** Given a substance, predict how it will change if heated or cooled.	**3.PS.2.b1** Identify the possible states of matter for a given property (e.g., gas or liquids can take the shape of a container). **3.PS.2.b2** Identify how the state of matter will change if a substance is heated or cooled.	**3.PS.2.c1** Identify an object as being either a solid, a liquid, or a gas. **3.PS.2.c2** Identify if something is being heated or cooled.	• Predict how various objects will change when heated or cooled. • Match properties with states of matter (e.g., definite shape with solid, fills any volume with gas). • Identify the changes that exist as a material heats or cools (e.g., freezing, melting, boiling/evaporation, condensing). • Recognize that matter can change state when heated (e.g., observe ice changing state from solid to liquid to gas) or cooled (e.g., freeze water, watch condensation form on a cold beverage). • Given a situation identify whether something is being heated or cooled (e.g., sun shining on a sidewalk, ice cubes placed into water). • Recognize that different states of matter have different properties (e.g., manipulate various materials to determine how solids, liquids and gases differ. • Given objects, substances or pictures identify which are solids, liquids and gases.
3.PS.3 Heat, electrical energy, light, sound, and magnetic energy are forms of energy. There are many different forms of energy. Energy is the ability to cause motion or create change. The different forms of energy that are outlined at this grade level should be limited to familiar forms that a student is able to observe.	**3.PS.3.a1** Explain the difference between two or more types of energy. **3.PS.3.a2** Design a simple experiment that would show a form of energy making a change.	**3.PS.3.b1** Identify multiple forms of energy. **3.PS.3.b2** Match a type of energy to an example of change (e.g., light bulb on, light bulb off - electrical energy).	**3.PS.3.c1** Identify a form of energy. **3.PS.3.c2** Identify a change in energy (e.g., a light turned on after being plugged in).	• Demonstrate a way that energy can cause a change (e.g., dropping a ball in a bucket of sand, turning on a light, turning on a fan, rice vibrating on the surface of a drum). • Match pictures to the type of energy depicted. • Identify when there is a change of energy (e.g., flipping on a light, turning the volume up on a speaker, watching a magnet move an object, lighting a candle and observing heat and light). • Identify objects that use different types of energy (e.g., heat, electrical, light, sound, magnetic). • Recognize that there are different types of energy (e.g., heat, electrical, sound, light, magnetic).

Grade 4

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
Most Complex ←				→ Least Complex
Earth and Space Science				
4.ESS.1 Earth's surface has specific characteristics and landforms that can be identified. About 70 percent of Earth's surface is covered with water, and most of that is the ocean. Only a small portion of Earth's water is freshwater, which is found in rivers, lakes, groundwater, and glaciers. Earth's surface can change due to erosion and deposition of soil, rock, or sediment. Catastrophic events such as flooding, volcanic activity, and earthquakes can also create landforms.	**4.ESS.1.a1** Explain how a surface process has changed an area of the Earth's surface. **4.ESS.1.a2** Using a visual or actual field observation, describe specific landform features.	**4.ESS.1.b1** Match a surface process to the landform that it creates (e.g., volcanic activity can create an island). **4.ESS.1.b2** Match the names of landforms to a picture or description.	**4.ESS.1.c1** Identify a characteristic of the Earth's surface. **4.ESS.1.c2** Identify Earth's landforms.	• Given a series of pictures showing deposition (delta forming, riverbank getting bigger) place them in order. • Identify products of deposition (e.g., delta forming, hill, river bank getting bigger). • Given a series of pictures showing erosion (mud washing across a road, hill getting smaller) place them in order. • Match landforms to the process that formed them. • Identify agents of erosion (e.g., wind, water, ice). • Go outside the school or watch a video and identify a place where erosion is occurring. • Show on a diagram where to find ground water. • Choose the picture of Earth which shows the correct distribution of water and land. • Match given pictures or descriptions to names of landforms. • Identify given pictures of landforms and features (e.g., mountains, volcanoes, lakes, oceans, rivers and their floodplains, islands).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
4.ESS.2 The surface of Earth changes due to weathering. Rocks change shape, size, and/or form due to water or glacial movement, freeze and thaw, wind, plant growth, acid rain, pollution, and catastrophic events such as earthquakes, flooding, and volcanic activity. Note: Differentiating between chemical and physical weathering is not the focus at this grade level.	**4.ESS.2.a** Describe ways that weathering (e.g., freezing/thawing, plant growth, flooding, wind, acid rain, etc.) affects landforms.	**4.ESS.2.b** Match a change in a landform caused by weathering to the type of weathering that occurred (e.g., a crack getting larger from water freezing).	**4.ESS.2.c** Identify an effect of weathering.	• Sequence a series of pictures that illustrate weathering (e.g., sidewalk break with plants coming through, statue wearing away due to acid rain). • Categorize pictures of weathering into their causes (wind, water, plant growth, freeze-thaw). • Describe the effects that catastrophic events have on Earth's surface. • Identify types of catastrophic events (e.g., earthquakes, volcanic eruptions, flooding) • Identify that repeated freezing and thawing weathers earth materials. • Watch a pothole grow throughout the winter (in the community or time lapse video) and describe the process that is causing it grow. • Identify that wind and moving water weather earth materials. • Recognize that weathering is a process in nature that changes the shape, size and/or form of rocks.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
4.ESS.3 The surface of Earth changes due to erosion and deposition. Liquid water, wind, and ice physically remove and carry rock, soil, and sediment (erosion) and deposit the material in a new location (deposition). Gravitational force affects movements of water, rock, and soil.	**4.ESS.3.a** Predict the effect on a landform when a natural force is introduced (e.g., erosion and deposition).	**4.ESS.3.b** Identify a change in a landform that was caused by erosion or deposition (e.g., formation of valleys, sand dunes, etc.).	**4.ESS.3.c** Identify natural forces that can move rock and soil (e.g., erosion and deposition).	• Given a natural process predict what effect it will have a particular landform (e.g., a flood will deposit mud on roads in the floodplain, a wind storm will blow mulch out of flowerbeds). • Identify features that result from glaciers (e.g., using Google Earth, geologic maps, pictures). • Identify geologic features in Ohio (e.g., using topographic maps or aerial photographs). • Categorize changes in a landform as deposition or erosion. • Trace the path of water in the process of erosion and deposition. • List wind, water and ice as agents of erosion and deposition. • Recognize that erosion and deposition are processes in nature that move eEarth materials (e.g., soil, rocks). • Describe the effects of water running down a pile of sand or soil. • Watch a time lapse video of erosion or deposition in action and identify changes that occur.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Life Science		
4.LS.1 Changes in an organism's environment are sometimes beneficial to its survival and sometimes harmful. Ecosystems can change gradually or dramatically. When the environment changes, some plants and animals survive and reproduce and others die or move to new locations. Ecosystems are based on interrelationships among and between biotic and abiotic factors. These include the diversity of other organisms present, the availability of food and other resources, and the physical attributes of the environment.	**4.LS.a1** Given an ecosystem, describe changes that could be harmful or beneficial to an organism in that ecosystem. **4.LS.a2** Describe environmental changes that are sudden or gradual.	**4.LS.1.b1** Within a given ecosystem, identify which organisms would benefit or which organisms would be harmed after a change occurs. **4.LS.1.b2** Match environmental changes as sudden or gradual.	**4.LS.1.c1** Identify that a given change in an ecosystem can be beneficial or harmful to a specific organism in that ecosystem. **4.LS.1.c2** Identify environmental changes as sudden or gradual.	• Given a series of pictures showing deposition (delta forming, riverbank getting bigger) place them in order. • Identify products of deposition (e.g., delta forming, hill, river bank getting bigger). • Given a series of pictures showing erosion (mud washing across a road, hill getting smaller) place them in order. • Match landforms to the process that formed them. • Identify agents of erosion (e.g., wind, water, ice). • Go outside the school or watch a video and identify a place where erosion is occurring. • Show on a diagram where to find ground water. • Choose the picture of Earth which shows the correct distribution of water and land. • Match given pictures or descriptions to names of landforms. • Identify given pictures of landforms and features (mountains, volcanoes, lakes, oceans, rivers and their floodplains, islands). Given a picture of an ecosystem describe a change that would be beneficial to an organism and a change that would be harmful. • Sort the effects of a change in an ecosystem as harmful or beneficial to a population of organisms. • Given a series of pictures of environmental changes, identify them as gradual or sudden. • Identify a connection between an abiotic factor and a living organism in an environment. • List the resources in the environment that support living things. • Sort pictures into categories of biotic (living) and abiotic (nonliving).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
4.LS.2 Fossils can be compared to one another and to present-day organisms according to their similarities and differences. The concept of biodiversity is expanded to include different classification schemes based upon shared internal and external characteristics of organisms. Most species that have lived on Earth are extinct. Fossils provide a point of comparison between the types of organisms that lived long ago and those existing today.	**4.LS.2.a1** Explain the pre-historic environment that a fossil organism may have lived in and compare that to the present day environment where the fossil was found. **4.LS.2.a2** Given a set of fossils and present day organisms, explain why some fossil organisms do not have a present day representative.	**4.LS.2.b1** Given a fossil organism, identify the pre-historic environment it would have lived in, and compare that to the present day environment where the fossil was found. **4.LS.2.b2** Given a set of fossils and present day organisms, sort them by similar characteristics.	**4.LS.2.c1** Match a fossil to an ecosystem that it would have lived in. **4.LS.2.c2** Match a fossil with a representation of the organism.	• Explain why we have found fossils of some animals that no longer exist. • Match a fossil to an environment where it may have lived. • Recognize that environments change (compare prehistoric fossil environments to current day environments). • Match pictures of extinct organisms to modern organisms that are similar • Identify differences between pictures of extinct organisms to modern organisms that are similar • Recognize that some types of organisms that lived in the past no longer exist. • Compare a fossil to a representation of the organism. • Identify a fossil. • Note: Introductory material about fossils can be found in 2.LS.2 for students who need an earlier entry point.Sequence a series of pictures that illustrate weathering (e.g., sidewalk break with plants coming through, statue wearing away due to acid rain). • Categorize pictures of weathering into their causes (wind, water, plant growth, freeze-thaw). • Describe the effects that catastrophic events have on Earth's surface. • Identify types of catastrophic events (e.g., earthquakes, volcanic eruptions, flooding) • Identify that repeated freezing and thawing weathers earth materials. • Watch a pothole grow throughout the winter (in the community or time lapse video) and describe the process that is causing it grow. • Identify that wind and moving water weather earth materials. • Recognize that weathering is a process in nature that changes the shape, size and/or form of rocks.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Physical Science		
4.PS.1 When objects break into smaller pieces, dissolve, or change state, the total amount of matter is conserved. When an object is broken into smaller pieces, when a solid is dissolved in a liquid, or when matter changes state (solid, liquid, gas), the total amount of matter remains constant. Note: Differentiation between mass and weight is not necessary at this grade level.	**4.PS.1.a** Make a prediction about what will happen to the mass of an object after a change of state occurs.	**4.PS.1.b** When given multiple objects, make changes to their physical state and measure the mass before and after the changes are made to determine conservation of mass.	**4.PS.1.c** Recognize that the mass of a given object remains the same before and after a physical change is made to that object.	• Given the mass before dissolving, breaking or a phase change, predict the mass after the change. • Explain why the mass before and after a change are the same (all the same materials are still there). • Recognize that the total mass does not change when substances are dissolved (e.g., measure the mass of water plus salt while separated and after the salt is dissolved in the water). • Recognize that mass does not change when physical changes occur (e.g., measure the mass before and after breaking an object into pieces, melting ice, or rearranged Legos into a new structure). • Note: Measuring mass was introduced in 3.PS.1.Given a natural process predict what effect it will have a particular landform (e.g., a flood will deposit mud on roads in the floodplain, a wind storm will blow mulch out of flowerbeds). • Identify features that result from glaciers (e.g., using Google Earth, geologic maps, pictures). • Identify geologic features in Ohio (e.g., using topographic maps or aerial photographs). • Categorize changes in a landform as deposition or erosion. • Trace the path of water in the process of erosion and deposition. • List wind, water and ice as agents of erosion and deposition. • Recognize that erosion and deposition are processes in nature that move Earth materials (e.g., soil, rocks). • Describe the effects of water running down a pile of sand or soil. • Watch a time lapse video of erosion or deposition in action and identify changes that occur.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
4.PS.2 Energy can be transferred from one location to another or can be transformed from one form to another. Energy transfers from hot objects to cold objects as heat, resulting in a temperature change. Electric circuits require a complete loop of conducting materials through which an electrical energy can be transferred. Electrical energy in circuits can be transformed to other forms of energy, including light, heat, sound, and motion. Electricity and magnetism are closely related.	**4.PS.2.a1** Sort objects by whether or not they transfer energy. **4.PS.2.a2** Describe how one form of energy is transformed to another form.	**4.PS.2.b1** Identify examples of how different types of energy may be transferred or how different types of energy may not be transferred. **4.PS.2.b2** Demonstrate how energy can be transformed.	**4.PS.2.c1** Identify an example of energy transfer (e.g., the handle of a pot on the stove may become hot to the touch, showing transfer of thermal energy from the pot to your hand). **4.PS.2.c2** Identify an example of how a type of energy can transform to another type of energy (e.g., electricity transforms to light energy when a lamp is turned on).	• Demonstrate how an electromagnet shows that electricity causes a magnetic field. • Demonstrate how a complete electric circuit can cause an energy transformation (e.g., light a bulb, ring a buzzer). • Identify that some materials transfer electrical energy better than others (e.g., copper versus rubber). • Recognize that a complete loop is need for electric energy to flow in a circuit. • Design a way to determine which materials will keep a drink hot or cold the longest. • Identify that some materials transfer heat energy more easily than others (e.g., styrofoam versus metal). • Identify examples of energy transfers and energy transformations (e.g., watch a machine or video where energy transfers are occurring such as a Rube Goldberg device and identify locations where energy is transferred or transformed). • Identify that energy can change from one form to another (e.g, measure the temperature of a substance (water, air) before and after the sun shines on it and identify that light energy has changed to heat). • Identify that energy can move from place to place. (e.g. measure the temperature of hot water as it cools on a tabletop and identify that heat is leaving the water and entering the air). • Note: Forms of energy are introduced in 3.PS.3.Given a picture of an ecosystem describe a change that would be beneficial to an organism and a change that would be harmful. • Sort the effects of a change in an ecosystem as harmful or beneficial to a population of organisms. • Given a series of pictures of environmental changes, identify them as gradual or sudden. • Identify a connection between an abiotic factor and a living organism in an environment. • List the resources in the environment that support living things. • Sort pictures into categories of biotic (living) and abiotic (nonliving).

Grade 5

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
Most Complex ←				→ Least Complex
Earth and Space Science				
5.ESS.1 The solar system includes the sun and all celestial bodies that orbit the sun. Each planet in the solar system has unique characteristics. The distance from the sun, size, composition, and movement of each planet are unique. Planets revolve around the sun in elliptical orbits. Some of the planets have moons and/or debris that orbit them. Comets, asteroids, dwarf planets, and meteoroids also orbit the sun.	**5.ESS.1.a1** Compare different celestial bodies including composition and size. **5.ESS.1.a2** Explain what would happen to orbits if there was no gravitational force. **5.ESS.1.a3** Compare the composition and sizes of the major planets.	**5.ESS.1.b1** Match a set of descriptions to the corresponding set of celestial bodies. **5.ESS.1.b2** Identify examples of celestial objects that are being affected by a gravitational force resulting in an orbit. **5.ESS.1.b3** Match the composition of the major planets as related to their position in the solar system (e.g., rocky planets are close to the sun, gas giants are further from sun).	**5.ESS.1.c1** Identify celestial bodies in our solar system. **5.ESS.1.c2** Identify a representation of an orbital path within our solar system. **5.ESS.1.c3** Identify Earth's place in our solar system.	• Build a model of a comet. (e.g., Freeze muddy water in a paper cup, use it to depict a comet and to show what happens when it orbits near the hot sun by letting it sit out for a short time (some melts off the outside and it gets smaller)). • Recognize that gravity holds the planets in orbit (e.g., roll a marble around a paper plate with a wedge cut out that has a dab of paint right before the cut out. Use the paint trail as the marble leaves the plate to see that a planet would fly away in a straight line if gravity was not causing it to orbit the sun.) • Demonstrate the movement of planets around the sun in an orbit (e.g., Twirl a plastic ball on a string in a circle on the table, understand that this is how planets and moons orbit, indicate that the string exerts a force towards your hand just like gravity pulls on planets.). • Match pictures of the planets in our solar system with descriptions of them (e.g., for Jupiter made of gas, largest planet, 5th planet from sun, has a giant red spot hurricane) • Compare the size of the inner and outer planets. • On a graphic of the solar system, recognize that rocky planets are near the sun and gas planets are further away. • Identify the composition of outer planets (gaseous). • Identify the composition of Earth and inner planets (rocky planets). • Trace the path that the moon follows around Earth on a diagram. • Trace the path that Earth follows around the sun on a diagram. • Identify other celestial bodies (asteroids, dwarf planets, meteoroids) of the solar system. • Recognize a graphic representation or drawing of the solar system. • Identify the celestial body (Earth) where we live. • Recognize a photo of the moon. • Recognize a photo of the sun. • Recognize a photo of Earth. • Engage in activities that demonstrate gravity as a force (dropping a ball, jumping, etc.). • Engage in the movement of celestial bodies (planets, moons, comets, asteroids) in the solar system. • Engage with structural materials that make up celestial bodies (rocky materials, ice, water, gases) • Engage with visual or tactile models of celestial bodies and/or the solar system.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
5.ESS.2: The sun is one of many stars that exist in the universe. The sun appears to be the largest star in the sky because it is the closest star to Earth. Some stars are larger than the sun and some stars are smaller than the sun.	**5.ESS.2.a1** Compare the Sun to stars beyond our solar system. **5.ESS.2.a2** Explain how a constellation can be used for navigation. **5.ESS.2.a3** Compare the characteristics of different stars (e.g., size, brightness, age).	**5.ESS.2.b1** Explain the relationship of our Sun to our solar system and to our universe. **5.ESS.2.b2** Explain that the pattern of stars within a constellation stays constant. **5.ESS.2.b3** Describe the characteristics of the Sun that make it a star.	**5.ESS.2.c1** Identify that the Sun is a star and that the Sun is the only star in our solar system. **5.ESS.2.c2** Identify a visual representation of a constellation. **5.ESS.2.c3** Identify the characteristics of the Sun that make it a star.	• Explain that our sun is brightest because it is closest to Earth. • Recognize that stars in the universe can be close or far away similar to everyday objects (e.g., Look at the same object (cup) when it is near you body, measure it with you thumb and index finger, see how its size changes when it is across the room), use this to understand that giant stars look tiny to us on Earth because they are very far away (you could also look at houses or trees out the window and discuss that the house is not actually only 1 inch high). • Recognize that the sun is one of many stars in the universe. • Identify our sun as a medium star. (Look at pictures, charts, graphs or videos to compare sizes of stars.) • Identify groups of stars as constellations (Can discuss how people could use the star patterns to tell time and navigate before we had modern technology). Watch videos of the movement in the night sky, recognize that the stars always move in the same pattern . • Enrichment: Given several pictures of groups of stars, choose one and tell what it looks like (tree, bear, snake, cloud, etc). Tell an imaginary story about the object, use this to understand that people made up constellations and stories about them.) • Recognize that the sun is the only star in our solar system. • Identify the sun as the star, celestial body, of our solar system. • Identify the sun as our primary source of energy. • Recognize that the sun is our closest star. • Identify the sun as a star. • Engage in and compare in various visual representations of stars (e.g., 5 point star versus a NASA picture of the sun). • Understand that stars (including the sun) give off heat and light. • Feel the heat of the sun on a sunny day. (Set a thermometer in a cup of water in the sun and watch the temperature rise.)

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
5.ESS.3 Most of the cycles and patterns of motion between the Earth and sun are predictable. Earth's revolution around the sun takes approximately 365 days. Earth completes one rotation on its axis in a 24-hour period, producing day and night. This rotation makes the sun, stars, and moon appear to change position in the sky.	**5.ESS.3.a** Explain the difference between Earth's revolution and Earth's rotation.	**5.ESS.3.b** Sort patterns into those that result from Earth's revolution and those that result from Earth's rotation.	**5.ESS.3.c** Identify patterns that result from Earth's revolution and rotation.	• Use data of daylight hours to show how the number of daylight hours changes season-to-season. • Track and record sunrise, sunset times throughout the year and calculate the number of daylight hours. • Observe images of the night sky at different seasons to witness the change in visible constellations. • Match seasonal characteristics to number of daylight hours and a visual representation of the positions of the Earth and sun. • Identify the year can be broken down into seasons (summer, fall, winter, spring) • Recognize that Earth makes one revolution every 365 days (or one year). • Use a model to show that Earth orbits the sun, recognize that this is called revolution. • Identify "revolution" as movement around another object in a path. • Model revolution of an object moving in an orbital pattern around another object (Earth and sun). • Map the position of the sun across the sky throughout the day. (Watch the shadow of an object throughout the school day to illustrate the movement of the sun, use a stick or pole in the sun and draw a line (chalk on pavement, or paper placed under the stick) for the shadow each hour of the school day.) • Describe differences between day and night (dark at night). • Make a model representing the sun and Earth's rotation to illustrate the difference between day and night.(e.g., Turn off the lights in the room, turn on a lamp, bulb or flashlight on one side of the room, turn in a circle, explain that you only see the lamp when you are facing it.) • Recognize that Earth makes one rotation every 24 hours. • Identify "rotation" as a spinning around a given point. • Identify that Earth's rotation causes day and night. (Show videos to illustrate the movement of the stars in the night sky.) • Model day and night onwith Earth with a ball and a flashlight. • Engage in movement of models of the Earth, moon, and sun (e.g., spinning and moving around other objects).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Life Science		
5.LS.1 Organisms perform a variety of roles in an ecosystem. Populations of organisms can be categorized by how they acquire energy. Food webs can be used to identify the relationships among producers, consumers, and decomposers in an ecosystem.	**5.LS.1.a1** Explain the role of a producer, consumer, or decomposer in a food web. **5.LS.1.a2** Trace the flow of energy through a food web.	**5.LS.1.b1** Given a set of organisms, match them to their roles in a food web. **5.LS.b2** Sequence components of a food web.	**5.LS.1c1** Identify a producer, consumer, and decomposer. **5.LS.1.c2** Sequence components of a simple food chain.	• Choose pictures to illustrate the various symbiotic relationships;, mutualism, parasitism and commensalism. (Show a picture of bees and flowers and describe the relationship between the two organisms. Bees pollinate flowers and the bee gets energy. Both roles are important for survival.) • Match pictures of consumers and producers with their roles (herbivores, carnivores, omnivores, decomposers). • Recognize that organisms interact and depend on one another. • In an ecosystem determine who eats who and show the energy flow using arrows (e.g., a food chain illustrating deer eating grass, wolves eating deer etc.). • Identify living things as producers (plants) or consumers (animals). • Given a picture of an ecosystem, identify all the living things. • Engage in following a path of energy on a food web (e.g., trace arrows on a food chain). • Engage with pictures of various organisms (plants and animals).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
5.LS.2 All of the processes that take place within organisms require energy. For most ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transformed by producers through the process of photosynthesis. That energy is used or stored by the producer and can be passed from organism to organism as illustrated in food webs.	**5.LS.2.a** Use a food web to explain how an organism can get a constant flow of energy.	**5.LS.2.b** Identify that producers transform sun energy into energy it uses to grow and that consumers get their energy to grow by a transfer of energy from another organism.	**5.LS.2.c** Identify ways that organisms can obtain energy.	• Construct a model of a food web showing the sun with arrows illustrating the flow of energy. • Recognize that the sun's energy gets transformed into energy for plants which gets consumed by other organisms. • Recognize that most organisms depend on the sun's energy. • Identify that vitamin D is produced in the body with 10-15 minutes of sun exposure on arms, legs, or torso. • Feel the heat and see the light from the sun on a sunny day. • Identify the organisms that make up our food choices. (If it is an animal source, ask students where that animal got its energy from. If it is a plant, where did the plant get its energy?. Use this information to build a simple food chain/ web.) • Demonstrate the use of energy by moving parts of the body. • Engage in discussions about foods and what you eat.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Physical Science		
5.PS.1 The amount of change in movement of an object is based on the mass* of the object and the amount of force exerted. Movement can be measured by speed. The speed of an object is calculated by determining the distance (d) traveled in a period of time (t). Any change in speed of an object requires a force and is affected by the mass of the object and the amount of force applied. Note: Differentiating between mass and weight is not necessary at this grade level.	**5.PS.1.a** Given a change in mass or force, explain the effect that change will have on the speed of an object.	**5.PS.1.b** Identify a change that can be made to an object to change its speed (e.g., add more mass, use more force).	**5.PS.1.c** Demonstrate how the speed of an object can be changed by adding mass or exerting a force.	• Predict ways to change the movement of a given model (e.g., add bricks to a cart, push with more/less force, etc.). • Manipulate a given model to demonstrate the force required to move various masses. • Using manipulatives, identify which objects require more force (push or pull) to move. • Recognize objects in motion. • Move objects of varying masses. • Engage with objects of varying masses.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
5.PS.2 Light and sound are forms of energy that behave in predictable ways. Light travels and maintains its direction until it interacts with an object or moves from one medium to another and then it can be reflected, refracted, or absorbed. Sound is produced by vibrating objects and requires a medium through which to travel. The rate of vibration is related to the pitch of the sound. Note: At this grade level, the discussion of light and sound should be based on observable behavior. Waves are introduced at the middle school level.	**5.PS.2.a1** Given an object, explain how it would change the path of light (e.g., a mirror will reflect light, a dark cloth will absorb light, etc.). **5.PS.2.a2** Given an object, explain how you could make a change that would change its pitch.	**5.PS.2.b1** Identify objects that will change the path of light. **5.PS.2.b2** Identify properties that affect pitch (e.g., a large bell makes a deeper sound than a smaller bell).	**5.PS.2.c1** Demonstrate the observable characteristics of how light travels. **5.PS.2.c2** Match objects/tools/ instruments to examples of sounds of various pitch.	• Sound: • Listen to sounds at various pitches, describe them as high or low. • Pluck a tight string and listen to it, shorten the string and pluck it again, describe the differences. • Recognize that objects (strings, drums) vibrate when they make sound. • Use a variety of objects to make sound (plucking, drumming, blowing). • Light: • Sort objects by whether they reflect, refract or absorb light. • Given a group of objects (or pictures) choose the ones that light can pass through (e.g., shine a flashlight or laser pointer onto a mirror, trace the path of the light that is reflected. Shine a flashlight onto black cloth and onto white cloth, describe the differences you see). • Recognize changes in light as a result of interactions with various objects that have differing results. • Use a variety of objects to make sound (plucking, drumming, blowing). • Engage in light play from various sources.

Grade 6

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
Most Complex ←				→ Least Complex
Earth and Space Science				
6.ESS.1 Minerals have specific, quantifiable properties. Minerals are naturally occurring, inorganic solids that have a defined chemical composition. Minerals have properties that can be observed and measured. Minerals form in specific environments.	**6.ESS.1a** Sort minerals by properties (e.g., color, density, luster).	**6.ESS.1b** Identify a common rock-forming mineral.	**6.ESS.1c** Identify an object as a mineral or a rock.	• Compare rocks and minerals. • Match a sample rock or mineral to a given set of properties. • Manipulate both rocks and minerals to identify characteristics of each (e.g., rubbing on a piece of paper, breaking into pieces, feeling texture, etc.) • Engage with various minerals and rocks.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
6.ESS.2 Igneous, metamorphic, and sedimentary rocks have unique characteristics that can be used for identification and/or classification. Most rocks are composed of one or more minerals, but there are a few types of sedimentary rocks that contain organic material, such as coal. The composition of the rock, types of mineral present, and/or mineral shape and size can be used to identify the rock and to interpret its history of formation, breakdown (weathering), and transport (erosion).	**6.ESS.2a** Classify igneous, metamorphic, or sedimentary rocks.	**6.ESS.2b** Identify the properties of igneous rocks (e.g., granite, basalt), metamorphic rocks (e.g., marble, quartzite), or sedimentary rocks (layers).	**6.ESS.2c** Sort rocks by textual characteristics.	• Compare the characteristics of igneous, metamorphic and sedimentary rocks. • Match a sample rock to its origin given a set of characteristics (e.g., using pictures, maps, illustrations, etc.) • Manipulate rocks to identify textural characteristics of each. • Engage with various types of rocks.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
6.ESS.3 Igneous, metamorphic, and sedimentary rocks form in different ways. Magma or lava cools and crystallizes to form igneous rocks. Heat and pressure applied to existing rock forms metamorphic rocks. Sedimentary rock forms as existing rock weathers chemically and/or physically and the weathered material is compressed and then lithifies. Each rock type can provide information about the environment in which it was formed.	**6.ESS.3a** Identify how each rock type is formed (e.g., pressure, erosion, cooling, melting, compaction, cementation, heat, and/or weathering).	**6.ESS.3b** Compare parts of the rock cycle (e.g., some rocks form from pressure while some form from lava).	**6.ESS.3c** Identify a component of a rock cycle.	• Given characteristics of a rock or location in the rock cycle, identify the specific rock type. • Match where a given rock fits into the rock cycle. • Explore a variety of different rocks and identify specific characteristics of the rock. • Identify the processes that can change a rock (e.g., heat, pressure, lava cooling, etc.). • Actively participate in discussion about an animation or simulation that illustrates the rock cycle (e.g., the creation of coal). • Engage with various visual or tactile representations of the rock cycle. • Engage with materials that can represent the formation of rocks (e.g., different colors of playdoh).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
6.ESS.4 Soil is unconsolidated material that contains nutrient matter and weathered rock. Soil formation occurs at different rates and is based on environmental conditions, types of existing bedrock, and rates of weathering. Soil forms in layers known as horizons. Soil horizons can be distinguished from one another based on properties that can be measured. The terms dirt and soil are not synonymous; use the term "soil." Note: The emphasis should be on properties of soil rather than memorization.	**6.ESS.4a** Identify the different properties of each layer (horizon) of soil.	**6.ESS.4b** Recognize that soils can have different properties (e.g., texture, color, composition, permeability, porosity).	**6.ESS.4c** Identify the components of soil (e.g., small pieces of rock and living and decaying organisms).	• Investigate plant growth in a variety of soils. • Match characteristics of soil to its purpose or use. • Identify the different layers in a soil sample/cross section as "horizons". • Manipulate different soil samples to identify characteristics of each (e.g., texture, color, composition, permeability, porosity). • Engage with different samples of soil.
6.ESS.5 Rocks, minerals, and soils have common and practical uses. Nearly all manufactured material requires some kind of geologic resource. Most geologic resources are considered nonrenewable. Rocks, minerals, and soil are examples of geologic resources that are nonrenewable.	**6.ESS.5a** Classify specific rocks, minerals, or soils into their general use (agriculture, transportation, construction, domestic, energy, and technology).	**6.ESS.5b** Identify a common use for rocks, minerals, or soils.	**6.ESS.5c** Identify that rocks, minerals, and soils are nonrenewable resources that are used by people in many ways.	• Identify what happens when a nonrenewable resource is used (e.g., coal is burned up to create heat). • Match a rock or mineral to its industrial use (e.g., road salt, jewellery, building material, etc.). • Identify the practical use of rocks, minerals, or soils found in everyday items. • Engage with common products that are made with rocks, minerals, or soils.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Life Science		
6.LS.1 Cells are the fundamental unit of life. All living things are composed of cells. Different body tissues and organs are made of different kinds of cells. The ways cells function are similar in all living organisms. Note: Emphasis should be placed on the function and coordination of cell organelles as well as their roles in overall cell function. Specific information about the organelles that need to be addressed at this grade level will be found in the model curriculum.	**6.LS.1a** Explain how cells are organized to form multicellular organisms (cells make up tissue such as muscle).	**6.LS.1b** Recognize that organisms can be made of only one cell or can be made of many cells.	**6.LS.1c** Recognize that living things are made of cells.	• Match cell organelles to the specific function they perform in a cell. • Recognize that cells work together to perform different functions for the organism (e.g., groups of special cells work together to create an organ called the heart that pumps blood throughout an organism's body). • Identify the needs of all living things (energy, removal of waste, reproduction, etc.). • Identify that a cell has smaller parts that perform their own functions for living things. • Compare differences between plants and animals at the macro- and microscopic level. • Identify a single-celled versus a multicellular organism. • Identify relative size of a single cell to a known organism or object (e.g., have students engage with various models to describe the relative size of a cell). • Engage with models or visuals of single-celled and multicellular organisms (both plant and animal). • Engage with or manipulate a model of a cell (both plant and animal).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
6.LS.2 All cells come from pre-existing cells. Cells repeatedly divide, resulting in more cells and growth and repair in multicellular organisms. Note: This is not a detailed discussion of the phases of mitosis or meiosis. The focus should be on reproduction as a means of transmitting genetic information from one generation to the next, cellular growth, and repair.	**6.LS.2a** Describe that every cell contains information about traits that can be passed to the next generation through reproduction or cell division.	**6.LS.2b** Identify that cells multiply for growth, repair, and reproduction.	**6.LS.2c** Identify that cells can multiply to produce more cells.	• Recognize that cells have a master set of directions for structure and function within a living system. For multicellular organisms, only a portion of the genetic information is used. • Identify a situation where a cell is multiplying in order to grow or repair (e.g., provide images of cut on human skin and a scab forming, cut hair and regrowth). • Recognize that cell division results in growth of an organism or the production of cells to replace cells. • Identify the source of a specific type of cell (e.g., muscle cell was produced from another muscle cell). • Actively participate in discussion of how organisms grow or how bodies make repairs (e.g., what happens when you get a cut?) • Engage in visual models or animations of a cell dividing and developing into an embryo. • Engage in visual models or animations of a cell dividing and creating an exact copy.Match cell organelles to the specific function they perform in a cell. • Recognize that cells work together to perform different functions for the organism (e.g., groups of special cells work together to create an organ called the heart that pumps blood throughout an organism's body). • Identify the needs of all living things (energy, removal of waste, reproduction, etc.). • Identify that a cell has smaller parts that perform their own functions for living things. • Compare differences between plants and animals at the macro and microscopic level. • Identify a single-celled versus a multicellular organism. • Identify relative size of a single cell to a known organism or object (e.g., have students engage with various models to describe the relative size of a cell). • Engage with models or visuals of single-celled and multicellular organisms (both plant and animal). • Engage with or manipulate a model of a cell (both plant and animal).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
6.LS.3 Cells carry on specific functions that sustain life. Many basic functions of organisms occur in cells. Cells take in nutrients and energy to perform work, like making various molecules required by that cell or an organism. Every cell is covered by a membrane that controls what can enter and leave the cell. Within the cell are specialized parts for the transport of materials, energy capture and release, protein building, waste disposal, information feedback, and movement. Note: Emphasis should be placed on the function and coordination of cell components, as well as on their roles in overall cell function.	**6.LS.3a** Explain that each cell part has a distinct structure and function that is critical to life.	**6.LS.3b** Match an organelle to its function.	**6.LS.3c** Identify an organelle in a cell.	• Identify at least one difference between a plant and animal cell (e.g., cell wall versus cell membrane, presence or absence of chloroplasts). • Recognize that cells have smaller parts called "organelles". • Engage with and manipulate a cell model to illustrate cell parts (both plant and animal).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
6.LS.4 Living systems at all levels of organization demonstrate the complementary nature of structure and function. The level of organization within organisms includes cells, tissues, organs, organ systems, and whole organisms. Whether the organism is single-celled or multicellular, all parts function as a whole to perform the tasks necessary for the survival of the organism.	**6.LS.4a** Compare and contrast different types of cells and tissues.	**6.LS.4b** Identify that cells make up tissues, which make up organs.	**6.LS.4c** Identify a plant cell and an animal cell.	• Recognize that all organs/organ systems work together to provide function for an organism. • Recognize that organs that work together to perform a specific job make up an organ system • Recognize that similar tissues put together make up an organ. • Recognize that a group of similar cells make up a larger structure called "tissue". • Recognize at least one difference between a plant and animal cell (e.g., cell wall versus cell membrane, presence or absence of chloroplasts). • Engage with pictures and models of various types of cells (plant and animal).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Physical Science		
6.PS.1 Matter is made up of small particles called atoms. Matter has mass, volume and density and is made up of particles called atoms. Elements are a class of substances composed of a single kind of atom. Molecules are the combination of two or more atoms that are joined together chemically.	**6.PS.1a** Compare objects based on the properties of matter (e.g., mass, volume, density).	**6.PS.1b** Identify a property of matter that can be measured (e.g., mass, volume, density).	**6.PS.1c** Identify that matter is made of atoms, which are too small to be seen.	• Explore different materials of the same size and note similarities and difference. (Use a steellead beaarring and a foam ball of the same size and note the mass, volume and density.) • Make a model representing atoms joined together to create a substance (e.g., use Legos to create an object or "substance", then change the size, number, or color of Legos to create a new "substance"). • Recognize unique characteristics of substances (e.g., size, color, malleability, mass, volume). • Recognize atoms as the "building blocks" of all substances (i.e. they make up everything). • Recognize that objects can be broken down into smaller and smaller pieces that eventually we cannot see (e.g., physically reduce the size of various objects (break them down into smaller and smaller pieces until they can no longer be reduced)). • Recognize the size of an atom compared to an everyday object (i.e. understand that atoms can't be seen with the naked just their eyes). • Engage with a visual representation of atoms of elements such as the Periodic Table of Elements. • Engage with models of atoms and molecules. • Engage with objects that represent "building blocks" (e.gi.e., smaller pieces that can be put together to create a larger object, such as Legos). • Engage with items of the same size and shape, but varying masses, or items of same mass, but varying sizes/ shapes.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
6.PS.2 Changes of state are explained by a model of matter composed of particles that are in motion. Temperature is a measure of the average motion of the particles in a substance. Heat is a process of energy transfer rather than a type of energy. Energy transfer can result in a change in temperature or a phase change. When substances undergo changes of state, atoms change their motion and position. Note: It is not the intent of this standard to encourage vocabulary identification (matching definitions with heat, temperature, and thermal energy). Instead, these are provided as conceptual tools for understanding the role of energy in physical, biotic, atmospheric, oceanic, and geologic systems covered in grade 6 and subsequent grades and courses.	**6.PS.2a** Compare the motion of the particles that make up solids, liquids, gases (e.g., solid particles are close together; gas particles are far apart).	**6.PS.2b** Identify that heating an object causes the particles of the object to speed up.	**6.PS.2c** Recognize that heating an object can make it change from a solid to a liquid to a gas.	• Model movement of particles in a state of matter as heat or energy is added or taken away. • Identify what is present to cause a change of state (i.e. increased energy or heat). • Relate particle movement to the characteristics of the various states of matter, e.g., liquids and gases flow and take the shape of their container because atoms move over and around each other. Solids have a definite shape due to the limited movement of the atoms. • Model movement of particles in each state of matter. • Recognize that particles in matter move according to their "state" (solid-particles vibrate, liquid-particles move around each other, gas-particles move in all directions). • Recognize that matter is made of particles (atoms) that move. • Recognize a "change of state" as matter changing from liquid to solid, liquid to gas, solid to liquid, etc.) • Identify the states of matter that exist as ice melts (e.g., solid, liquid, gas). • Engage with an animation of particle movement as a substance changes phase as a result of adding or removing heat. • Actively participate in discussion about a change in state demonstration (e.g., ice changing state from solid to liquid to gas on a hot plate). • Engage with various solids, liquids, and gases that can change their state within a relatively short amount of time.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
6.PS.3 There are two categories of energy: kinetic and potential. Objects and substances in motion have kinetic energy. Objects and substances can have energy as a result of their position (potential energy). Note: Chemical and elastic potential energy should not be included at this grade; this is found in PS grade 7.	**6.PS.3a** Identify when an object has the greatest/ least kinetic and/or potential energy.	**6.PS.3b** Recognize that the potential energy of an object changes based on its height and recognize that the kinetic energy of an object changes based on its speed.	**6.PS.3c** Identify examples of potential or kinetic energy in a model or visual representation.	• (Example for 6.PS.3c) Observe a Rube Goldberg machine (Mouse Trap game) in action and identify the types energy employed. Identify places where potential and kinetic energy are the greatest or least. (think Mouse Trap game). • Model the effect of an increase or decrease of potential energy on an object's kinetic energy (e.g., drop a ball from different heights and compare the heights of the resulting bounces--"If I drop a ball from really high, the bounce will be bigger."; skiing on the bunny hill versus advanced hill). • Match picture examples to either having kinetic or potential energy. • Recognize that objects in motion are said to have "kinetic" energy and those at rest have "potential" energy. • Identify if an object is in motion or at rest. • Engage with various objects that are at rest or in motion.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
6.PS.4 An object's motion can be described by its speed and the direction in which it is moving. An object's position can be measured and graphed as a function of time.	**6.PS.4a** Explain how speed involves both distance and time.	**6.PS.4b** Identify the speed and direction of a moving object.	**6.PS.4c** Identify factors that affect the speed of an object.	• Match different ramp characteristics to graphs that represent an object's motion. • Identify how a model must be manipulated to change the speed and direction of an object according to specific requirements (e.g., increase the speed, change the direction of motion and distance to the left). • Recognize that on a speed graph (showing distance vs. time)a line with represented with a steep slope is an object moving faster than a line represented by a low slope. • Manipulate the heights and slopes of a ramp to change how fast and how far an object like a ball travels. • Engage with graphs representing objects moving at high and low speeds. • Engage with timers when observing movement of objects. • Engage with models that demonstrate objects moving at different speeds.

Grade 7

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
Most Complex ←				→ Least Complex
Earth and Space Science				
7.ESS.1 The hydrologic cycle illustrates the changing states of water as it moves through the lithosphere, biosphere, hydrosphere, and atmosphere. Thermal energy is transferred as water changes state throughout the cycle. The cycling of water in the atmosphere is an important part of weather patterns on Earth. The rate at which water flows through soil and rock is dependent upon the porosity and permeability of the soil or rock.	**7.ESS.1a** Build a hydrologic cycle showing evaporation, condensation, precipitation, and surface run-off.	**7.ESS.1b** Identify evaporation, condensation, and precipitation.	**7.ESS.1c** Identify types of precipitation.	• Recognize that condensation in the sky forms clouds and different types of clouds can determine weather (e.g., dark clouds mean rain, light puffy white clouds mean nice weather). • Recognize that condensation is caused by a decrease in energy of molecules that changes water vapor (gas) to liquid water. • Recognize that evaporation is caused by an increase in energy of molecules (can be modeled by applying heat) that changes liquid water to gas. • Identify the changing states of water as it moves through the water cycle. • Trace a water molecule through the water cycle starting with a raindrop (be sure to include surface runoff). • Match pictures to types of precipitation (rain, snow, sleet, hail). • Recognize that water that falls from the sky is "precipitation". • Actively participate in discussion about what happens to water, or where water comes from in the water cycle (e.g., a dish of water left out for several days seems to have disappeared, water falls from the sky). • Engage with a sealed terrarium or other model to observe the behavior of water (water cycle)

Learning Standard	Complexity a	Complexity b	Complexity c	Learning Progression Building the Base & Engagement
7.ESS.2 Thermal-energy transfers in the ocean and the atmosphere contribute to the formation of currents, which influence global climate patterns. The sun is the major source of energy for wind, air, and ocean currents and the hydrologic cycle. As thermal energy transfers occur in the atmosphere and ocean, currents form. Large bodies of water can influence weather and climate. The jet stream is an example of an atmospheric current and the Gulf Stream is an example of an oceanic current. Ocean currents are influenced by factors other than thermal energy, such as water density, mineral content (such as salinity), ocean floor topography, and Earth's rotation. All of these factors delineate global climate patterns on Earth.	**7.ESS.2a** Describe how thermal energy affects ocean and atmospheric currents.	**7.ESS.2b** Identify that air and water move due to currents.	**7.ESS.2c** Identify how temperature causes air and water to move.	• Predict the type of weather and climate an area may have based on atmospheric and/or oceanic currents (e.g., show the jet stream bringing rainy weather from the western U.S. on a map and predict what weather Ohio will receive, show warm or cold ocean currents on a map and predict what kind of climate an area has--Why does eastern United States usually have warmer climate?). • Recognize that adding or taking away heat can cause particles of matter to speed up or slow down. • Identify the movement of air and water as convection currents. • Recognize the sun as a source of energy or heat that can move air and water on Earth. • Recognize wind patterns across the United States. • Observe and record the direction the wind blows each day to determine patterns (e.g., notice that it should blows in the same direction (from the west in Ohio) most days (can watch a flag outside the window)). • Engage with maps illustrating global wind or ocean currents. • Engage with models that show how air or water can move (e.g., can heat one side of a pan of water and place a drop food coloring into the pan and watch how it moves).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
7.ESS.3 The atmosphere has different properties at different elevations and contains a mixture of gases that cycle through the lithosphere, biosphere, hydrosphere, and atmosphere. The atmosphere is held to Earth by the force of gravity. There are defined layers of the atmosphere that have specific properties, such as temperature, chemical composition, and physical characteristics. Gases in the atmosphere include nitrogen, oxygen, water vapor, carbon dioxide, and other trace gases. Biogeochemical cycles illustrate the movement of specific elements or molecules (such as carbon or nitrogen) through the lithosphere, biosphere, hydrosphere, and atmosphere. Note: The emphasis is on why the atmosphere has defined layers, not on naming the layers.	**7.ESS.3a** Recognize that natural events and human activities can cause changes in the Earth's atmosphere (e.g., by adding pollution to the atmosphere or depleting valuable gases).	**7.ESS.3b** Identify a gas that is naturally present in our atmosphere (e.g., oxygen, nitrogen).	**7.ESS.3c** Identify the atmosphere as the air around us.	• Recognize that humans impact the composition of the atmosphere (e.g., pollution can add too much carbon). • Identify pictures from a set that represent pollution to the atmosphere (e.g., human activities--factories, plowing, cars; natural events--volcanoes, dust storms, wildfires). • Identify how the gases in the atmosphere are important for living things (e.g., oxygen for respiration, nitrogen for plants, carbon dioxide for photosynthesis). • Given a visual representation or diagram, identify a gas found in the atmosphere. • Recognize that temperature changes in each layer of the atmosphere. • Engage with models depicting the different layers of atmosphere. • Recognize that the atmosphere is made of gases. • Recognize the atmosphere as the invisible gas that surrounds us.. • Engage with models depicting the different layers of atmosphere.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
7.ESS.4 The relative patterns of motion and positions of Earth, moon, and sun cause solar and lunar eclipses, tides, and phases of the moon. The moon's orbit and its change of position relative to Earth and sun result in different parts of the moon being visible from Earth (phases of the moon). A solar eclipse is when Earth moves into the shadow of the moon (during a new moon). A lunar eclipse is when the moon moves into the shadow of Earth (during a full moon). Gravitational force between Earth and the moon causes daily oceanic tides. When the gravitational forces from the sun and moon align (at new and full moons), spring tides occur. When the gravitational forces of the sun and moon are perpendicular (at first and last quarter moons), neap tides occur.	**7.ESS.4a** Show how the positions of the Earth, the moon, and the sun cause tides and phases of the moon.	**7.ESS.4b** Recognize different stages in the lunar cycle (e.g., full moon, new moon).	**7.ESS.4c** Recognize that the moon orbits around the Earth.	• Using a model, recognize the position of the moon relative to Earth during a high or low tide. • Given a tide table, identify the pattern (amount of time) that occurs between high and low tide and high tide to next high tide. • Engage with visuals of ocean tides on a time lapse video over a certain period of time (day, month, or season). • Observe pictures of solar and lunar eclipses and line up models of Earth, moon and sun in the alignment that would cause the eclipse (can match pictures of the alignments). • Engage with models of the Earth, moon, and Sun (a light), to create shadows on both the Earth and moon. • Match phases of the moon (as seen from Earth) with a visual representation of the positions of the Earth, moon, and sun. • Trace the changes in the lit portion of the moon as it goes through one cycle (i.e. lit portion increases then decreases). • Trace the motion of the moon around Earth on a drawing or diagram. • Engage in various visual representations of moon phases (e.g., time lapse video, a moon lamp).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
7.ESS.5 The relative positions of Earth and the sun cause patterns we call seasons. Earth's axis is tilted at an angle of 23.5°. This tilt, along with Earth's revolution around the sun, affects the amount of direct sunlight that the Earth receives in a single day and throughout the year. The average daily temperature is related to the amount of direct sunlight received.	**7.ESS.5a** Compare the amount of direct sunlight on Earth as it tilts toward or away from the sun, and show how that relates to summer and winter season.	**7.ESS.5b** Model the tilt of the Earth towards or away from the sun.	**7.ESS.5c** Recognize that the Earth is tilted.	• Compare the temperature of a thermometer when a light is shining straight down on a thermometer, to the temperature when you shine the same light from the side, and relate this to the temperature ranges at different locations on Earth. • Recognize the connection between temperature data for a season andto the amount of sunlight received in that season (e.g., longer daylight hours in the summer versus the winter). • Track and record sunrise and sunset times to observe how daylight hours change by season. • Use data of temperatures to show how the temperature changes season-to-season. • Track and record temperature data for a year to recognize temperature ranges for each season. • Model the sun shining on the Earth. Show the tilt of the Earth causes seasons (tilt toward the sun is summer, tilt away from the sun is winter). • Engage with a model of Earth and light (sun).

Learning Standard	Complexity a	Complexity b	Complexity c	Learning Progression Building the Base & Engagement
Life Science				
7.LS.1 Energy flows and matter is transferred continuously from one organism to another and between organisms and their physical environments. Plants use the energy in light to make sugars out of carbon dioxide and water (photosynthesis). These materials can be used or stored for later use. Organisms that eat plants break down plant structures to release the energy and produce the materials needed to survive. The organism may then be consumed by other organisms for materials and energy. Energy can transform from one form to another in living things. Animals get energy from oxidizing food, releasing some of its energy as heat. The total amount of matter and energy remains constant, even though its form and location change. Note: Chemical reactions in terms of subatomic structures of atoms are not appropriate at this grade level. Chemical reactions are presented as the rearrangement of atoms in molecules.	**7.LS.1a** Demonstrate the flow of energy from plants to consumers (e.g., energy pyramid).	**7.LS.1b** Trace the path of oxygen between plants and animals (e.g., plants create oxygen during photosynthesis and animals breathe in oxygen to produce carbon dioxide).	**7.LS.1c** Identify that plants use light energy to make their own food (photosynthesis) and humans and animals consume other organisms to get energy.	• Recognize that the energy from the sun flows through each trophic level (energy pyramid). • Recognize that the sun provides energy for living things on Earth. • Recognize that plants depend on carbon dioxide for photosynthesis. • Recognize that animals depend on plants for oxygen. • Trace how energy is transferred from one organism to another (start with the sun). • Given a food web, identify producers and consumers and show how they depend upon one another. • Identify how humans and other animals obtain energy (eating). • Identify that light is needed for plants to perform photosynthesis to make food. • Identify the energy source for plants. • Engage in following a path of energy on a food web (e.g., trace arrows on a food chain). • Engage with pictures of various organisms (plants and animals).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
7.LS.2 In any particular biome, the number, growth, and survival of organisms and populations depend on biotic and abiotic factors. The variety of physical (abiotic) conditions that exists on Earth gives rise to diverse environments (biomes) and allows for the existence of a wide variety of organisms (biodiversity). Biomes are regional ecosystems characterized by distinct types of organisms that have developed under specific soil and climatic conditions. Ecosystems are dynamic in nature; the number and types of species fluctuate over time. Disruptions, deliberate or inadvertent, to the physical (abiotic) or biological (biotic) components of an ecosystem impact the composition of an ecosystem.	**7.LS.2a** Provide examples of how a plant/ animal population changes in relation to the availability of certain resources and characteristics of a given biome.	**7.LS.2b** Match a given ecosystem/ biome with its characteristics.	**7.LS.2c** Identify an ecosystem or a biome.	• Given a specific environment, alter one component and predict the how that environment will be impacted (e.g., a disease wipes out a species of tree, drought, invasive species). • Given a specific organism, build a model of an ecosystem to represent their biome. • Match pictures of plants and animals to biomes that are suitable habitats. • Given a specific biome and organism, identify biotic or abiotic factors that the organism relies on for survival. • Using pictures of various biomes, identify abiotic and biotic factors in the biome. • Identify pictures as biotic (plant and animals) or abiotic factors (soil, air, water). • Based on picture cues, identify general temperature conditions in a biome. • Identify common plants and animals found in a picture of a given biome. • Engage with pictures of various organisms (plants and animals) in their environment.

Learning Standard	Complexity a	Complexity b	Complexity c	Learning Progression Building the Base & Engagement
Physical Science				
7.PS.1 Elements can be organized by properties. Elements can be classified as metals, non-metals, and metalloids, and can be organized by similar properties such as color, solubility, hardness, density, conductivity, melting point and boiling point, viscosity, and malleability. Note 1: This is the conceptual introduction of the Periodic Table of Elements and should be limited to classifications based on observable properties; it should not include the names of the families.	**7.PS.1a** Sort common elements found on the periodic table by properties (e.g., metals, nonmetals, gases).	**7.PS.1b** Identify an element on the Periodic Table of Elements based on its properties (e.g., metal, non-metal, and gases).	**7.PS.1c** Identify common elements (e.g., oxygen, hydrogen, iron, helium, calcium, carbon) found on the Periodic Table of Elements.	• Given a group of elements, identify them as metals or nonmetals. • Identify common properties of metals (e.g., luster, color, conductivity). • Recognize that elements can be sorted by their properties. • Choose a method to sort a set of objects (candy, toys, shoes) and describe how they were sorted (by color, size, type of sole). • Recognize the Periodic Table of Elements. • Engage with a picture based Periodic Table of Elements. • Engage with materials that would be found on the Periodic Table of Elements (e.g., silver or gold jewelry, iron, helium in balloons, carbon-graphite, etc.)

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
7.PS.2 Matter can be separated or changed, but in a closed system, the number and types of atoms remains constant. When substances interact and form new substances, the properties of the new substances may be very different from those of the original substances, but the amount of mass does not change. Physically combining two or more substances forms a mixture, which can be separated through physical processes. Note: Under these standards, classifying specific changes as chemical or physical is not appropriate.	**7.PS.2a** Explain that the mass and number of atoms remains the same after being combined in a mixture or a compound.	**7.PS.2b** Identify at least one difference between a mixture and a compound (e.g., mixtures can be separated by physical processes).	**7.PS.2c** Identify the components of a given mixture.	• Predict the mass of a substance after a chemical reaction (e.g., baking soda and vinegar in a sealed baggie) or after a mixture is produced. (Note: This is great illustration that gas has mass because the mass should stay the same but baggie will expand. For demonstration purposes, this is a closed system). • Recognize that the same atoms are present before and after a change, they are just rearranged. • Identify the mass of components before and after a change (mixing two substances together (rocks and sand)). • Separate a mixture. • Create a mixture (e.g., water and salt, water and sugar, salt and pepper). • Engage with different mixtures (e.g., rocks and sand, different candies in a bowl).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
7.PS.3 Energy can be transformed or transferred but is never lost. When energy is transferred from one system to another, the quantity of energy before transfer equals the quantity of energy after transfer. When energy is transformed from one form to another, the total amount of energy remains the same.	**7.PS.3a** Describe what happens to an object as it transfers energy elsewhere (e.g., toy car slows down going uphill as energy changes from kinetic to potential).	**7.PS.3b** Demonstrate energy transfer by completing a circuit (e.g., switch to activate a mechanical item).	**7.PS.3c** Identify an energy transfer (e.g., electricity to light after a lamp is plugged in).	• Recognize that the total amount of energy before and after a change remains the same. • Given an electric circuit (or diagram of one), identify places where energy is transformed from one form to another (e.g., electricity to light and heat, chemical energy to electricity). • Given an example, (such as Rube Goldberg device videos (many are available online)) identify locations where energy is transferred or transformed. • Recognize the difference between energy transfer (moving from one location to another as in heat energy from hot tea moving to an ice cube and melting it) and energy transformation (changing from one form of energy to another as in electrical energy from a wall changing to sound, radiant, and thermal energy in a tv). • Actively participate in a demonstration that causes energy to transform from one form to another. • Engage with objects that involve energy transformations (e.g., a flashlight, radio, tv, etc.).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
7.PS.4 Energy can be transferred through a variety of ways. Mechanical energy can be transferred when objects push or pull on each other over a distance. Mechanical and electromagnetic waves transfer energy when they interact with matter. Thermal energy can be transferred through radiation, convection and conduction. An electrical circuit transfers energy from a source to a device. Note 1: Energy transfers should be experiential and observable at this grade level.	**7.PS.4a** Describe how some energy is transferred in waves (e.g., water, heat, light).	**7.PS.4b** Identify ways energy can be transferred (e.g., push and pull, heat from hot to cold objects, light from the sun, electricity through wires, etc.).	**7.PS.4c** Transfer energy in an object by a force (e.g., push or pull).	• Model how energy can be transferred in a system (e.g., boat on water wave, light from cell phone to eye, turning on an electrical circuit). • Recognize a heat transfer as moving from a warmer object or region to a cooler one (e.g., touch an ice cube, feel heat from a heater). • Recognize movement of a substance as a transfer of energy (e.g., movement of water in a wave, movement of a slinky). • Engage in watching a video that shows how energy is transferred in ocean waves. • Engage with items that demonstrate a transfer of energy (e.g., stretch and release a rubber band, push a toy car, push on a slinky)to illustrate the change from potential to kinetic energy.

Grade 8

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
Most Complex ←				→ Least Complex
		Earth and Space Science		
8.ESS.1 The composition and properties of Earth's interior are identified by the behavior of seismic waves. The refraction and reflection of seismic waves as they move through one type of material to another is used to differentiate the layers of Earth's interior. Earth has a core, a mantle, and a crust. Impacts during planetary formation generated heat. These impacts converted gravitational potential energy to heat. Earth's core is also able to generate its own thermal energy because of decaying atoms. This continuously releases thermal energy. Thermal energy generated from Earth's core drives convection currents in the asthenosphere. Note 1: Radioactive decay is not the focus; this will be discussed in physical science and chemistry. Note 2: At this grade level, analyzing seismograms (e.g., amplitude and lag time) and reading a travel time curve are not the focus. At this grade, the properties of seismic waves should be addressed.	**8.ESS.1a** Match properties to the correct layer of Earth.	**8.ESS.1b** Identify Earth's core, mantle, outer core, and inner core.	**8.ESS.1c** Recognize that the inside of the Earth is made up of distinct layers.	• Model how waves travel through solids and liquids using a spring toy. • Recognize that seismic waves travel through the Earth. • Recognize that waves travel differently in solids and liquids. • Match the composition to each layer (crust, mantle, inner and outer core). • Recognize that the layers are composed of different materials (solids and liquids/molten material). • Identify the layers of the Earth. • Engage with a model of the Earth and its layers.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
8.ESS.2 Earth's lithosphere consists of major and minor tectonic plates that move relative to each other. Historical data and observations such as fossil distribution, paleomagnetism, continental drift, and sea-floor spreading contributed to the theory of plate tectonics. The rigid tectonic plates move with the molten rock and magma beneath them in the upper mantle. Convection currents in the asthenosphere cause the movement of the lithospheric plates. The energy that forms convection currents comes from deep within the Earth. There are three main types of plate boundaries: divergent, convergent, and transform. Each type of boundary results in specific motion and causes events (such as earthquakes or volcanic activity) or features (such as mountains or trenches) that are indicative of the type of boundary.	**8.ESS.2a** Identify the different types of plate boundaries (e.g., convergent, divergent, transform).	**8.ESS.2b** Recognize that the crust is broken into plates that move.	**8.ESS.2c** Identify the layer of Earth that we live on as the crust.	• Identify the plate movements that produce specific landforms (e.g. volcanoes, earthquakes, mountains, trenches, rift valleys) • Match plate boundaries with their movement. (Use a video or simulation to show plate movement by means of convection currents.) • Recognize that convection currents (movement in the mantle caused by uneven heating inside the Earth) in the mantle cause movement of the plates. • Recognize the crust is made up of plates that move. • Recognize patterns of the location and formations of various types of landforms (e.g., mountains at the edges of continents). • Identify the landforms that exist on the crust. • Engage with a topographic map to see and feel the changes in landforms at various locations.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** ***Building the Base & Engagement***
8.ESS.3 A combination of constructive and destructive geologic processes formed Earth's surface. Earth's surface is formed from a variety of different geologic processes, including but not limited to plate tectonics.	**8.ESS.3a** Categorize geologic processes as constructive (e.g., depositions, volcanoes spreading new layers) or destructive (e.g., flooding, volcanoes forming craters).	**8.ESS.3b** Identify destructive and constructive processes that change Earth's surface.	**8.ESS.3c** Identify a destructive process that changes Earth's surface.	• Match pictures of landforms to the events that formed them. • Model the motion of the plates by moving pieces of paper to replicate plate motion and see how it impacts the paper. Relate the changes in the paper to actual landforms on Earth. • Model a change in Earth's surface using various means and materials (sand and water, fan to represent wind, watch videos or use simulations that illustrate constructive and destructive processes). • Engage with a stream table to demonstrate erosion and deposition.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
8.ESS.4 Evidence of the dynamic changes of Earth's surface through time is found in the geologic record. Earth is approximately 4.6 billion years old. Earth history is based on observations of the geologic record and the understanding that processes observed at present day are similar to those that occurred in the past (uniformitarianism). There are different methods to determine relative and absolute age of some rock layers in the geologic record. Within a sequence of undisturbed sedimentary rocks, the oldest rocks are at the bottom (superposition). The geologic record can help identify past environmental and climate conditions.	**8.ESS.4a** Explain how fossils indicate Earth's history and environment changes.	**8.ESS.4b** Explain that fossils are millions of years old.	**8.ESS.4c** Identify that humans can study Earth's past by looking at layers of rocks and fossils.	• Determine what layer/rock is the oldest/youngest given a geologic cross section. • Match fossils with pictures of the environments in which they formed. • Identify that fossils in lower undisturbed rock layers are older than the fossils in rock layers above them (e.g., add a layer of sand, discuss organisms that lived there, discuss that over time another layer can be deposited, etc. and discuss which layer/fossil is oldest). • Recognize that some fossils are millions of years old. • Recognize that a rock layer's age can be different from other layers based on location. • Engage with a geologic cross section (exposed rock on the side of a highway) to show layers of rock and their composition.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Life Science		
8.LS.1 Diversity of species, a result of variation of traits, occurs through the process of evolution and extinction over many generations. The fossil records proide evidence that changes have occurred in number and types of species. Fossils provide important evidence of how life and environmental conditions have changed. Changes in environmental conditions can affect how beneficial a trait will be for the survival and reproductive success of an organism or an entire species. Throughout Earth's history, extinction of a species has occurred when the environment changes and the individual organisms of that species do not have the traits necessary to survive and reproduce in the changed environment. Most species (approximately 99 percent) that have lived on Earth are now extinct. Note: Population genetics and the ability to use statistical mathematics to predict changes in a gene pool are reserved for high school biology.	**8.LS.1a** Explain how fossils indicate how traits have changed over Earth's history.	**8.LS.1b** Identify how a trait could be helpful or harmful to the animal's survival after a change in an environmental condition.	**8.LS.1c** Explore animal traits and how they are useful for survival.	• Predict what would happen if a particular trait of an organism changed (how does it impact survival in the environment). • Predict what would happen to a group of organisms if the environment changed. (i.e., Looking at the traits in the group identify individuals most likely to survive environmental changes based on their given traits.) • Identify changes that occurred in an organism given a set of fossils for that ancestry (e.g. horses). • Identify how various traits help an organism to survive. • Identify the various traits that exist within a population of organisms (breed of dog, type of fur, length of fur, coloring) • Engage with visual representations of organisms with specific, special traits.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
8.LS.2 Every organism alive today comes from a long line of ancestors who reproduced successfully every generation. Reproduction is the transfer of genetic information from one generation to the next. It can occur with mixing of genes from two individuals (sexual reproduction). It can occur with the transfer of genes from one individual to the next generation (asexual reproduction). The ability to reproduce defines living things.	**8.LS.2a** Explain a survival benefit of sexual reproduction and a survival benefit of asexual reproduction.	**8.LS.2b** Describe that asexual reproduction results in the exact same traits as the parent and that sexual reproduction results in a mixing of traits from both parents.	**8.LS.2c** Identify the number of parents required for sexual and asexual reproduction.	• Trace the genetic contribution of each parent for sexual reproduction. • Recognize that genetic information is passed on from one generation to the next. • Given pictures of parents and their offspring sort them by sexual and asexual reproduction (asexual will all be identical to the parent, sexual will vary from the parent and each other). • Recognize that sexual reproduction requires 2 parents, and asexual reproduction requires 1. • Recognize that all living things come from a previous generation, parent(s). • Engage with photos of parents and offspring of a variety of species (plants and animals).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
8.LS.3 The characteristics of an organism are a result of inherited traits received from parent(s). Expression of all traits is determined by genes and environmental factors to varying degrees. Many genes influence more than one trait, and many traits are influenced by more than one gene. During reproduction, genetic information (DNA) is transmitted between parent and offspring. In asexual reproduction, the lone parent contributes DNA to the offspring. In sexual reproduction, both parents contribute DNA to the offspring. Note 1: The focus should be the link between DNA and traits without being explicit about the mechanisms involved. Note 2: The ways in which bacteria reproduce is beyond the scope of this content statement. Note 3: The molecular structure of DNA is not appropriate at this grade level.	**8.LS.3a** Communicate how characteristics are a result of the DNA inherited from parents.	**8.LS.3b** Identify DNA as the source of traits.	**8.LS.3c** Identify an inherited trait.	• Recognize the environment can influence traits (thick fur in cold regions, nutrition affects growth) • Use a pedigree with pictures of the resulting organisms to trace traits that are passed on from one generation to the next (several generations of puppies or kittenies). • Recognize that traits are passed on from one generation to the next by DNA. • Recognize similarities and differences of traits in one generation to the next. • Name an inherited trait in a given species. • Engage with family photos or photos of a species family.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Physical Science		
8.PS.1 Objects can experience a force due to an external field such as magnetic, electrostatic, or gravitational fields. Magnetic, electrical, and gravitational forces can act at a distance.	**8.PS.1a** Given an interaction, determine what type of force is acting on the object.	**8.PS.1b** Determine the type of interaction between objects (e.g., magnetic, electrostatic, or gravitational fields).	**8.PS.1c** Recognize that an object has experienced a force from an external field (e.g., magnetic, electrostatic, or gravitational fields).	• Sort pictures into categories of magnetic, electrostatic and gravitational situations. • Using provided models, determine the force that was used to cause a change (e.g., rub a balloon on hair and stick it to the wall, identify that electrostatic forces are holding it to the wall; drop an object from different heights and see how large a hole it makes in sand, predict what will happen if you dropped it from even higher). • Engage or experiment with various objects to model different forces (e.g., magnets, dropping objects, socks rubbed on carpet).
8.PS.2 Forces can act to change the motion of objects. The motion of an object is always measured with respect to a reference point. Forces can be added. The net force on an object is the sum of all the forces acting on the object. If there is a nonzero net force acting on an object, its speed and/or direction will change. Kinetic friction and drag are forces that act in a direction opposite the relative motion of objects.	**8.PS.2a** Complete a force diagram.	**8.PS.2b** Predict the result of an application of force in a particular direction.	**8.PS.2c** Show how a force on an object can change its direction.	• Create force diagrams to illustrate motion (arrows with various sizes and direction). • Identify ways to increase or decrease an object's motion. • Identify ways to change the direction of an object's motion. • Predict what will happen to a moving object if an additional force acts on it (wind gust, hits a bump, brakes are applied). • Engage with objects by manipulating their motion in a variety of ways. (Watch videos of objects exposed to a force and predict the motion that will result.)

Extended Standards with Learning Progressions for Science, High School

Physical Science

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
Most Complex ←				→ Least Complex
		Study of Matter		
PS.M.1 Classification of matter • Heterogeneous vs. homogeneous • Properties of matter • States of matter and its changes	**PS.M.1a1** Recognize the difference between a solution and mixture. **PS.M.1a2** Classify objects by their physical properties (e.g., weight, melting and boiling points). **PS.M.1a3** Describe how thermal energy moves (e.g., thermal energy as ice melts).	**PS.M.1b1** Identify a method to separate a mixture. **PS.M.1b2** Describe physical properties of matter (e.g., size, weight, shape, magnetic, melting and boiling points). **PS.M.1b3** Identify heat as thermal energy.	**PS.M.1c1** Create a mixture. **PS.M.1c2** Identify a physical property of matter. **PS.M.1c3** Identify heat as the cause of a phase change.	• Recognize that substances combine in a variety of ways (mixtures versus solutions). • Identify substances that can be dissolved by water (mixtures). • Group solids, liquids and gases. • Sort objects by a given physical property (e.g., size, shape, magnetic). • Separate a mixture • Create a mixture. • Manipulate various solids and liquids. • Identify hot and cold objects (heating and cooling). • Recognize that heat causes objects to change phase. (e.g.,' wWatch ice melt).
PS.M.2 Atoms • Models of the atom (components) • Ions (cations and anions) • Isotopes	**PS.M.2a** Identify parts of an atom (protons, neutrons, electrons).	**PS.M.2b** Identify a diagram or model of an atom.	**PS.M.2c** Identify that all matter is made of atoms.	• Match the parts of the atom to the representative parts of athe model. • IdentifySort the parts of the atom. • Identify that an atom has different parts. • Observe or manipulate a model of an atom. • Recognize that the atom is the building block of all matter.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
PS.M.3 Periodic trends of the elements • Periodic law • Representative groups	**PS.M.3a** Use a Periodic Table to answer questions (e.g., number of outer electrons, groupings).	**PS.M.3b** Recognize that elements are organized on the Periodic Table by their properties, number of protons, and number of outer electrons.	**PS.M.3c** Identify an element(s) on the periodic table.	• Exam each square in the periodic table and identify points of information (atomic number, symbol, atomic mass). • Recognize that groups of elements have unique characteristics and reactivity (based on the number of valence electrons). • Identify a pattern of change as you read the Periodic Table. • Identify that each element in the Pperiodic Ttable is unique. • Observe the Periodic Table.
PS.M.4 Bonding and compounds • Bonding (ionic and covalent) • Nomenclature	**PS.M.4a** Recognize that atoms can bond ionically or covalently.	**PS.M.4b** Recognize that atoms can bond (interact).	**PS.M.4c** Identify a chemical compound.	• Pair elements that can bond. • Recognize that atoms can share valence electrons (covalent bonding). • Recognize that atoms give or receive valence electrons (ionic bonding). • Identify what points of information on each square indicated how an element reacts. • Identify atoms that are typically non-reactive (based on position in the Periodic Table). • Identify groups of elements have similar properties and reactivity. • Observe the Periodic Table.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Energy and Waves		
PS.EW.1 Conservation of energy Quantifying kinetic energy Quantifying gravitational potential energy	**PS.EW.1a** Describe the requirement(s) to change an object's energy from kinetic to potential (or potential to kinetic).	**PS.EW.1b** When a given a situation, identify if the change in energy was to kinetic or potential energy.	**PS.EW.1c** Identify a situation that demonstrates a change to the kinetic or the potential energy of an object.	• Identify the energy transformations for an object in motion. • Observe a series of pictures and identify the energy in use (sledding down a hill and the transformations of energy). • Manipulate objects to demonstrate a change from potential to kinetic energy (slinky, spring, rubber band). • Name types of energy (kinetic or potential). • Observe how an object falls (lands solidly or bounces). • Indentify why an object falls. • Observe a falling object.
PS.EW.2 Transfer and transformation of energy (including work)	**PS.EW.2a** Describe how heat energy can be transferred (e.g., radiation, conduction, convection).	**PS.EW.2b** Identify the transformation of energy in a given scenario (e.g., light bulb).	**PS.EW.2c** Identify that energy can be transferred (e.g., electricity is transferred to light energy in a light bulb).	• Investigate how various light intensities can heat an object (light bulb size, color, distance). • Identify different ways to heat an object. (Use pictures to illustrate radiation, conduction and convection). • Identify how different initiators have different transfers of energy on an object (e.g. ice cube hit with a hammer, exposed to a flame, hand - push itpushed). • Identify what initiates a transfer of energy. • Observe various transfers of energy.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
PS.EW.4 Thermal energy	**PS.EW.4a1** Describe how thermal energy moves from a warmer object to a cooler object. **PS.EW.4a2** Describe how different colors of objects absorb thermal energy differently.	**PS.EW.4b1** Identify heat as thermal energy **PS.EW.4b2** Explore how thermal energy can be absorbed by objects.	**PS.EW.4c1** Identify heat as the cause of a phase change. **PS.EW.4c2** Follow the path of thermal energy transfer in a diagram.	• Identify patterns of heating in various objects (how hot it gets, time of exposure, types of materials). • Match characteristics with heating patterns and everyday uses (e.g., insulator in a lunch box, pot holders, thermal cups). • Recognize that thermal energy flows from warmer objects to cooler ones. • Investigate that objects absorb heat differently. (U (e.g., using a heat lamp, expose various objects to light for a given time and feel the temperature of the object.). • Identify the path of thermal energy transfer. (e.g., a pot of water on a stove/hot plate). • Observe a diagram displaying the transfer of energy.
Forces and Motion				
PS.FM.1 Motion Introduction to one-dimensional vectors Displacement, velocity (constant, average and instantaneous) and acceleration. Interpreting position vs. time and velocity vs. time graphs	**PS.FM.1a** Describe the motion of an object given its placement on a graph (position vs. time graph).	**PS.FM.1b** Identify the force (balanced or an unbalanced force) of a moving object.	**PS.FM.1c** Apply an unbalanced force to an object to change its motion (e.g., accelerate it, stop it, start it).	• Graph the motion of an object using paper, pencil and/or software programs. • Match arrow direction with the direction of motion. • Match arrow size to motion of an object (small with low speed, large with high speed) • Identify what information can be given with arrow size and direction. • Use arrows to represent the movement of an object. • Indicate directionality of motion of an object (eye movement, pointing). • Observe the motion of objects at different rates of speed.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
PS.FM.2 Forces Force diagrams Types of forces (gravity, friction, normal, tension) Field model for forces at a distance	**PS.FM.2a1** Create a force diagram by indicating the location and direction of the normal force. **PS.FM.2a2** Organize the surface types from "causes the most friction" (most difficult to push) to "causes the least amount of friction" (easiest to push).	**PS.FM.2b1** Label forces and/or directions of forces on a force diagram. **PS.FM.2b2** Investigate friction and normal force as it relates to moving an object (sliding furniture over different types of flooring).	**PS.FM.2c1** Identify a force on an object in a force diagram. **PS.FM.2c2** Recognize that diverse surface types cause friction differently.	• Sequence surface types from "causes the most friction" to "causes the least amount of friction" • Compare surface types by the amount of friction experienced by a moving object with the same force. • Investigate patterns of motion on the various surfaces. • Investigate the effect different surfaces have an an object. (e.g.,; slide an object on different surfaces such as. Ex: shag carpet, smooth carpet, wooden floor, ice). • Observe what happens when sliding objects over various surfaces.
PS.FM.3 Dynamics (how forces affect motion) Objects at rest Objects moving with constant velocity Accelerating objects	**PS.FM.3a** Describe a motion of an object given its position vs. time graph.	**PS.FM.3b** Apply an unbalanced force to an object to change its motion (e.g., accelerate it, stop it, start it).	**PS.FM.3c** Identify an unbalanced force.	• Match a visual of an object in motion with a position vs. time graph. • Demonstrate changing an object's motion by applying an unbalanced force (e.g., accelerate it, stop it, start it). • Recognize that adding and/or removing forces from an balanced object causes it to become change its motionunbalanced. • Recognize that when forces are unbalanced motion changes. • Identify the force that may beis acting on an object to change its motion. • Observe objects in various states of motion (standing still, moving at a constant speed, circular motion, speeding up, slowing down).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		The Universe		
PS.U.1 History of the universe	**PS.U.1a** Create a model that shows how the universe is expanding (e.g., blowing up a balloon).	**PS.U.1b** Identify a model that illustrates the Big Bang theory.	**PS.U.1c** Recognize that the universe is expanding.	• Demonstrate how the universe is expanding by creating a model. • Recognize that celestial movement is outward (away from each other). • Observe a model of our solar system moving within our galaxy. • Identify our galaxy. • Recognize that our solar system exists within a galaxy. • Observe a model of our solar system in motion.
PS.U.2 Galaxies	**PS.U.2a** Classify a galaxy based on its shape (e.g., spiral, barred-spiral, elliptical, irregular).	**PS.U.2b** Match two galaxies of the same type (e.g., spiral, elliptical).	**PS.U.2c** Recognize that many stars make up a galaxy.	• Use NASA data from a satellite, e.g., Hubble, to determine how long it takes to travel through our solar system. Using this time factor, think about how long it would take to travel to the nearest star. This helps to map out the size of the galaxy/universe. • Identify that light years are huge distances. • Know that behavior of lLight waves provides evidence for the motion of the universe (expanding). • Recognize that stars are in motion and are light years away from each other. • Create a list of celestial objects that will be found in a galaxy. (e.g., sun , planets, moon, asteroid, galaxy).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
PS.U.3 Stars Formation; stages of evolution Fusion in stars	**PS.U.3a** Match a star of a specific relative mass (e.g., low, medium, high) with its life cycle.	**PS.U.3b** Identify "mass" as the property that determines the life cycle of a star.	**PS.U.3c** Recognize that stars form from clouds of gas.	• Recognize that stars have a life cycle and those stages have certain characteristics based on composition of gases. • Recognize that light provides evidence of motion. • Recognize that stars give off light because of chemical reactions of gases. • Recognize that our sun is a star in the galaxy/universe and that we see it in the daytime due to proximity. • Observe the night sky and recognize stars.

Biology

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
Most Complex ⟵				⟶ Least Complex
		Heredity		
B.H.1 Cellular Genetics	**B.H.1a**.Describe that different genes code for proteins that determine different traits.	**B.H.1b** Communicate that genes code for specific traits (e.g., eye color, hair color).	**B.H.1c** Recognize that genes are made up of DNA.	• Build a model of DNA. • Recognize that DNA codes for proteins that physically make the traits. • Illustrate that portions of DNA represent a gene that codes for a variety of traits (hair, skin, feathers, leaves). • Manipulate a physical model of DNA. • Recognize that DNA is a set of instructions for the cell.
B.H.2 Structure and Function of DNA in Cells	**B.H.2a** Recognize that changing the segments of DNA molecules can alter genes.	**B.H.2b** Recognize that genes are made up of DNA, so changing the segments of DNA can alter genes.	**B.H.2c** When given a representation of individuals from the same parents, identify variations in physical traits.	• Recognize that changing the sequence of DNA may alter the development of a trait if the resulting protein is altered. • Recognize that in sexual reproduction DNA is contributed from two parents to produce a new organism (genetically unique). • Recognize that if the sequence of DNA is changed, the trait changes. • Recognize that the sequence of DNA is specific for development of specific traits.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
B.H.3 Genetic Mechanisms and Inheritance	**B.H.3a** Predict the possible phenotypes of an offspring when given the genotype of the parents (e.g., using a Punnett square).	**B.H.3b** Recognize that genes combine during sexual reproduction which causes the traits of offspring to not be exact replicas of either parent.	**B.H.3c** Identify X and Y as female and male chromosomes.	• Identify fertilization as sex cells combining.to produce a unique offspring. • Identify the products of meiosis, sex cells (egg and sperm). • Identify the genetic combination for female is XX and male is XY. • Recognize that sex cells contain half the genetic information for the next generation. • Observe a family pedigree and note the similarities and differences of the offspring.
B.H.4 Mutations	**B.H.4a** Describe how some mutations can be helpful and some can be harmful to organisms.	**B.H.4b** Recognize that genes can be altered and that those changed genes may then be passed to offspring.	**B.H.4c** Identify traits that can vary among a population (e.g., eye color, beak shape, etc.).	• Recognize that not all mutations have an impact on an organism. • Recognize that only mutations in sex cells get passed on to offspring. • Recognize that changes in DNA which causes different characteristics and functions are called mutations.. • In a given population identify the various forms of a trait that exist (e.g., fur color). • Observe a population of organisms to identify differences in individuals.
B.H.5 Modern Genetics	**B.H.5a** Describe specific ways in which scientists have used DNA to help people or the environment (e.g., sweeter fruit, etc.).	**B.H.5b** Identify one reason DNA would be purposely altered by humans.	**B.H.5c** Identify a model of DNA.	• Show pictures of animals and plants that have been genetically altered for food production. • Discuss important attributes a farmer should consider for a food crop (yield, taste, shelf life). • Describe why humans would want to change DNA in an organism. • List the differences in the tastes of heirloom produce. • Taste examples of heirloom tomatoes and store bought hybrids or field corn and hybrid sweet corn. • Recognize a model of DNA.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Evolution		
B.E.1 Mechanisms • Natural selection • Mutation • Genetic drift • Gene flow (immigration, emigration) • Sexual selection	**B.E.1a** Describe how the presence or absence of traits may help some individuals in a plant or animal population survive and reproduce in their environment (e.g., natural selection).	**B.E.1b** When given a population of animals or plants, identify how variation in traits impacts their ability to survive and reproduce (e.g., populations of endangered species).	**B.E.1c** When given a plant or animal, identify traits that help it to survive in its environment.	• Discuss how an organism must survive in order to pass on its traits (genes). • Discuss how successful genes in a population get passed on through reproduction. • Recognize that traits are produced by genes. • Provide pictures of animals or plants with a variety of traits and match them to the environment in which they would survive (e.g., lots of fur in a snowy region). • Discuss how coloration would impact a predator prey relationship, if prey is easy to see it is easy to catch and eat. (Pick up colored candies from a colored background and discuss why some colors are easier to see.) • Given pictures of bird beaks or teeth of mammals and discuss what kinds of food the animal would be best able to eat.
B.E.2 Speciation • Biological classification expanded to molecular evidence • Variation of organisms within a species due to population genetics and gene frequency	**B.E.2a** Identify evolutionary changes to a given species that have allowed the species to continue to survive and reproduce.	**B.E.2b** Diagram and describe the evolutionary change in a species.	**B.E.2c** Given a visual representation, identify a species that has changed over the course of many generations (e.g., cladogram diagram).	• Given a cladogram with pictures, make a prediction of what the next generation willould look like based on a given environment. • Use the horse as an example, show pictures of earlier forms and discuss the changes that have occurred. • Use a cladogram with pictures of the organisms to describe changes from one clade to the next (an organism compared to its ancestors). Show the evolution of a trait.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Diversity and Interdependence of Life		
B.DI.1 Biodiversity • Genetic diversity • Species diversity	**B.DI.1a** Explain how low genetic diversity impacts population size, energy flow or the cycle of matter in a given environment (e.g., Isle Royale Wolf population).	**B.DI.1b** When given two examples of an animal or plant in a given environment, describe which one would have the higher chance to survive or reproduce based on traits (e.g., fur coat thickness, coloration).	**B.DI.1c** When given an environment, recognize a plant or an animal that could survive in that environment.	• Show data (graphs or charts) for population sizes of predatory/prey for a particular environment and show how one species impacts another (e.g., wolves and moose oin Isle Royale). • Predict what will happen to an ecosystem when a population of organisms (wolves, ash trees) moves in or out. • Given pictures of two environments and a set of organism picture cards, place the organisms in the environment where they are most likely to survive. • Given two animals or plants, identify which of them is most likely to survive in a certain environment and match which traits would help it survive.
B.DI.2 Ecosystems • Equilibrium and disequilibrium • Carrying capacity	**B.DI.2a** Identify how both populations will change in a predator/prey relationship, when given a model of an ecosystem that is not in balance (e.g., carrying capacity).	**B.DI.2b** Identify how a human or natural change to an ecosystem results in a change to a predator or prey population.	**B.DI.2c** When given a set of before and after pictures of an ecosystem, (e.g., meadow changed to farm, forest changed to apartment buildings) observe the human caused changes.	• Given an ecosystem that has experienced an event (natural or man made) discuss how an impacted organism may change the dynamics of the ecosystem (carrying capacity). • Given an environment and an event (natural or man made) predict what organisms will survive, thrive or perish as a result of that event. • Match the cause to the effect of a change to an ecosystem. (Given two pictures of an ecosystem and an event which occurred identify which came first (e.g., meadow, forest, apartment complex, volcanic eruption). • Examine a given ecosystem and identify the relationships between organisms.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
B.DI.3 Loss of Diversity • Climate change • Anthropocene effects • Extinction • Invasive species	**B.DI.3a** Describe how drought, flood, volcanic eruption, habitat loss, or introduction of a new species may affect the diversity in an ecosystem.	**B.DI.3b** Match the cause (e.g., drought, flood, habitat loss, new species) to its effect on organisms in an ecosystem.	**B.DI.3c** Identify factors that can harm organisms in an environment (e.g., drought, floods, volcanic eruption, habitat loss, new species etc.).	• Match worldwide temperature data to a given environment and the changes that have occurred to the populations that live there. (e.g., polar ice caps, coral reefs). • Use populations numbers of native species after the introduction of zebra mussels to the Great Lakes to provide an example of how human activities can impact an ecosystem. • Discuss what happens to organisms in an ecosystem after a human activity. (Show pictures of human activities such as strip mining, mall building, home developments and match them with the aftermath photos of the environment.) • Discuss what happens to organisms in an ecosystem after a natural event. (Show pictures of natural events and match them with the aftermath photos of the environment.) • Recognize the human activities can change an ecosystem impacting organisms. • Recognize that natural events will change an ecosystem impacting organisms.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Cells		
B.C.1 Cell Structure • Structure, function and interrelatedness of cell organelles • Eukaryotic cells and prokaryotic cells	**B.C.1a** Compare and contrast a prokaryotic cell and a eukaryotic cell.	**B.C.1.b** Match the organelle with the process it helps to execute (e.g., chloroplast, photosynthesis).	**B.C.1.c** Identify the function of the cell membrane.	• Model materials going into and out of the cell. • Recognize that materials need to enter and leave the cell through the cell membrane. • Match cell organelles to functions. • Identify a cell as prokaryotic or eukaryotic. • Given a variety of cells sort into prokaryotic and eukaryotic cells. • Show what cell type is responsible for photosynthesis. • Given a cell with missing part, identify what function the cell is unable to do and how that affects the cell. • Recognize that cells are classified by their cell parts. • Recognize that organelles do specific jobs for the cell. • Recognize that cells have parts (organelles). • Recognize that all living things are made of cells.
B.C.2 Cellular Processes • Characteristics of life regulated by cellular processes • Photosynthesis, chemosynthesis, cellular respiration, biosynthesis of macromolecules	**B.C.2a** Describe how the cell needs specific conditions (e.g., temperature, pH) in order to perform its essential functions (e.g., respiration, photosynthesis).	**B.C.2b** Complete a diagram that depicts the process of photosynthesis.	**B.C.2c** Identify photosynthesis and cellular respiration as occurring in a cell.	• Identify the importance of photosynthesis. • Identify the importance of respiration. • Investigate plant seedlings in different environments (temperature, pH) to show optimum range of growth. • Identify the products of cellular respiration. • Identify the products of photosynthesis. [Use pictures to complete a diagram of the process of photosynthesis (picture of sun, tree, water, oxygen, carbon dioxide and glucose)] • Compare the cell to a factory and show how cells make products for an organism.

Chemistry

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
Most Complex ⟷ Least Complex				
Structure and Properties of Matter				
C.PM.1 Atomic structure • Evolution of atomic models/ theory • Electrons • Electron configurations	**C.PM.1a** Identify the location of a valence electron and/or how valance electrons affect an atom's interactions.	**C.PM.1b** Identify part(s) of an atom (i.e., protons, neutrons, electrons).	**C.PM.1c** Identify a diagram or model of an atom.	• Build a model of an atom including protons, neutrons or electrons. • Identify the valence electrons on a drawing or model on an atom. • Recognize that an atom's reactivity is based on its valence electrons. • Recognize that valence electrons are in the outside layer of an atom. • Identify that protons have a positive charge, neutrons are neutral, and electrons have a negative charge. • Place labels (protons, neutrons, electrons) on a drawing of an atom. • Select the diagram that shows an atom from a set of drawings. • Engage with a model of an atom.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
C.PM.2 Periodic table • Properties • Trends	**C.PM.2a** Use the periodic table to answer questions about types of elements and the properties of elements (e.g., number of outer electrons, groupings).	**C.PM.2b** Recognize that elements are organized on the periodic table by their properties, number of protons, and number of outer electrons.	**C.PM.2c** Identify an element(s) on the periodic table.	• Follow the progression of atomic numbers on the Periodic Table and note their reactivity. • Identify various categories of elements on the Periodic Table (e.g., groups, families, periods, metals, nonmetals and metalloids). • Know that elements in the same column have the same number of valence electrons. • Given an element, find another element on the Periodic Table that will have similar properties (choose one in the same column). • Recognize that elements in the same column have similar properties. • Identify atoms based on their atomic number (given a number find the name of an element). • Recognize the location of the atomic number of an element on the Periodic Table. • Use a Periodic Table's key to recognize elements. • Recognize the Periodic Table.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
C.PM.3 Chemical bonding • Ionic • Polar/covalent	**C.PM.3a** Identify the type of chemical bonding that has occurred in a given compound.	**C.PM.3b** Compare the characteristics of an ionic bond and a covalent bond.	**C.PM.3c** Identify bonding as an interaction between atoms.	• Combine (baking soda and vinegar, glue and laundry starch) or observe a simple compound (salt, water, sugar) identify that it is composed of more than one type of atom bonded together. • Use an atomic model and/or video to investigate that atoms interact to achieve 8 valence electrons (view the product). • Identify common substances that are bonded ionically and covalently. • Recognize an ion as an atom that has gained or lost valence electrons (which changes their electrical charge). • Recognize that ionic bonding is an attraction between oppositely charged ions. • Recognize that in covalent bonding atoms share valence electrons so that each have 8. • Recognize that different atoms react in different ways (ionic and covalent bonding).
C.PM.4 Representing compounds • Formula writing • Nomenclature • Models and shapes (Lewis structures, ball-and-stick, molecular geometries)	**C.PM.4a** Represent a chemical compound with a ball-and-stick model or chemical formula.	**C.PM.4b** Build a model of a chemical compound in a variety of ways (e.g., ball-and-stick model).	**C.PM.4c** Identify a compound as two or more elements coming together (combining).	• Use symbols for elements and subscripts to represent a compound observed in a ball and stick model (observe a model of water to discover the formula H2O). • Look at ball and stick or other models to identify the parts (atoms of elements) that make up a compound. • Use a ball and stick model to represent a chemical formula. • Match common elements and their symbols to develop compounds and formulas (hydrogen, oxygen, carbon , nitrogen). • Use a model to investigate that two or more elements can join to form a compound.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
C.PM.5 Quantifying matter				Complex and advanced learning standards in Ohio's New Learning Standards are not included in the extended standards.
C.PM.6 Intermolecular chemical bonding forces of attraction • Types and strengths • Implications for properties of substances • Melting and boiling point • Solubility • Vapor pressure	**C.PM.6a** Explore the properties of water and how they change when water is part of a solution (e.g., salt water solutions).	**C.PM.6b** Perform a task with a fixed amount of water and given amounts of a solute (e.g., powdered drink mix) to observe solutions and supersaturated solutions.	**C.PM.6c** Identify a solution when given a field of choices.	• Recognize that saturated means the maximum amount of a substance possible is dissolved (e.g., salt or sugar begins to visibly collect in the water; (Use a set amount of water, find the maximum amount of salt that can dissolve (saturated solution), change the temperature and see if more or less can be dissolved (hotter water will dissolve more salt). • Make a solution by combining two substances (sugar and water, salt water, powdered drink mix). • Understand that fresh water differs from salt water and that humans cannot drink salt water for hydration (some sea creatures can use salt water). • Observe a set of mixtures (can be pictures or virtual) and choose the ones that are solutions (salt water, rubbing alcohol from the drug store). • Recognize that dissolve means to distribute the particles of one substance throughout another substance. • Recognize solutions as mixtures that are evenly distributed throughout and show components visually (sugar, water, sugar, water, sugar, water). • Recognize that a mixture is two more more substances combined but not chemically joined.

Learning Standard	Complexity a	Complexity b	Complexity c	Learning Progression Building the Base & Engagement
		Interactions of Matter		
C.IM.1 Chemical reactions • Types of reactions • Kinetics • Energy • Equilibrium • Acids/bases	**C.IM.1a** Use litmus paper to test and determine the pH of a substance.	**C.IM.1b** Given a pH scale with common ingredients (e.g., orange juice, water, baking soda), determine if they are acid, neutral, or basic.	**C.IM.1b** Identify acid, neutral, and/or base on a pH scale.	• Visually show that combustion is fuel + oxygen + a small energy source to form water, carbon dioxide, and ash while releasing larger amounts of energy in the form of heat and light. • Observe combustion (burning a candle, starting a grill, having a campfire, household furnace) in class or virtually to recognize a combustion reaction. • Observe mixing an acid with a base to recognize a neutralization reaction (many cosmetology processes such as perms or dyes involve neutralization). • Recognize that there are a variety of ways that chemical reactions can happen, two of which are combustion and neutralization. • Watch a chemical reaction (in class or virtually), identify that bonds are being broken and formed using models. • Test various acids and bases with universal indicator (liquid or strips are easily purchased from science suppliers) to find the pH of the substance. • Represent the pH scale with pictures of products that range from 1-14 (e.g., orange juice to water to soap). • Categorize everyday objects (or pictures) into groups of acides, bases, and neutral. • Recognize that acidity is measured on a scale (pH) that goes from very acidic (1) to very basic (14) and that the center point (7) is considered neutral. • Relate everyday experiences to the pH scale (how acidic foods like lemons taste, how bases like soap feel slippery).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	*Learning Progression Building the Base & Engagement*
C.IM.2 Gas laws • Pressure, volume, and temperature • Ideal gas law	**C.IM.2a** Identify types of measurements used for measuring gases (volume, temperature, and pressure).	**C.IM.2b** Define gas as having no definite shape or volume.	**C.IM.2c** Identify a gas.	• Recognize that when the temperature of a gas is increased its volume will increase (tire pressure on a hot day, hot air balloon rises). • Recognize that when the volume of a gas is decreased the pressure will increase (popping a balloon by squeezing it). • Recognize that temperature, volume and pressure impact behavior of gases. • Use a balloon to demonstrate how temperature affects the volume of a gas (freezing a balloon with air will cause the molecules to move slowly and deflate the balloon; bringing balloon to room temperature will increase the size of the ballon because the molecules are moving faster hitting the edges of the balloon, increasing size). • Identify that empty containers are filled with gas (air). • Identify common gases (air, water vapor, oxygen, helium, carbon dioxide).
C.IM.3 Stoichiometry • Molar calculations • Solutions • Limiting reagents				Complex and advanced learning standards in Ohio's New Learning Standards are not included in the extended standards.

Environmental Science

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
Most Complex ←				→ Least Complex
Earth Systems: Interconnected Spheres of Earth				
ENV.ES.1 Biosphere • Evolution and adaptation in populations • Biodiversity • Ecosystems (equilibrium, species interactions, stability) • Population dynamics	**ENV.ES.1a** Predict the effects on the biosphere based on changes in a given population.	**ENV.ES.1b** Identify cause and effect of population change(s) within the biosphere.	**ENV.ES.1c** Recognize that the biosphere is occupied by living organisms.	• Predict what will happen if the Asian carp enter the Great Lakes. What may happen to the native fish populations? How does the Asian carp affect the food web of that ecosystem? • Examine native fish populations in areas that have been impacted by the invasion of Asian carp. Explore the relationship between the numbers of the native fish and the number of Asian carp after their arrival. Look at this in terms of the first month, six months, a year, several years. • Watch how Asian carp have taken over an area. • Identify local invasive species and illustrate how they have impacted the ecosystem. • List things that could cause the number of a particular type of organism to go up or down (food shortage, more babies born, disaster, organisms move into or out of the area). [Observe a map of the arrival and spread of an invasive species (e.g., kudzu).] • Identify that the part of Earth occupied by living things is called the biosphere. • Observe the school yard or a video and identify living organisms.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
ENV.ES.2 Atmosphere • Atmospheric properties and currents	**ENV.ES.2a** Analyze how greenhouse gases affect atmospheric properties.	**ENV.ES.2b** Identify atmospheric properties (e.g., temperature, humidity, density and pressure).	**ENV.ES.2c** Recognize air currents on a map.	• Raising cattle has had a impact on methane gas in the atmosphere. Observe the increase of methane gas in the atmosphere as the number of cattle has increased. • Examine a hundred year cycle of weather data for a region and find the patterns that emerge. • Map global temperatures for the last hundred years. • Track data for atmospheric gases in a region of the globe and observe the changes of gases that result from natural and human activity. This can be a historic look (e.g., industrial age) or current events. • Observe the data from hurricane season in the United States and identify the conditions that existed that generated the storms of that season. • Identify climates that exist around the globe. • Examine weather patterns in several locations around the globe. Track the temperature range and precipitation that prevails in that area. • Identify what causes the climate that exists in a regional area (e.g., use a felt map and arrows to create a map of global wind patterns). • Demonstrate how the sun warms the earth.This warming impacts climatic patterns that occur in a particular region. • Understand that wind in Ohio often blows from west to east and therefore weather events often arrive from the west. • Recognize that air often moves in the same pattern over and over. • Experience wind as moving air (blow on face, observe leaves/trees moving, fan, feel wind outside)

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
ENV.ES.3 Lithosphere • Geologic events and processes	**ENV.ES.3a** Describe how a geologic event can impact the other spheres (e.g., volcano eruption into the air, mudslide into water, etc.).	**ENV.ES.3b** List events that can occur within the lithosphere.	**ENV.ES.3c** Recognize that the lithosphere is the outer most layer (crust) of the surface of the Earth.	• Watch videos of the volcanic activity of Hawaii and predict how that eruption impacts the environment of the island. • List the emissions of a volcanic eruptions (e.g., lava, volcanic gases, ash) and explain how they will impact the environment locally and globally. • Identify the outer surface layer of the Earth as the lithosphere; understand that it is made of rock (some of which has weathered into soil and sand). • Recognize that the surface of Earth constantly changes. • Recognize that humans live on Earth's surface, the lithosphere.
ENV.ES.4 Hydrosphere • Oceanic currents and patterns (as they relate to climate) • Surface and ground water flow patterns and movement • Cryosphere • AND • ENV.ES.5 Movement of matter and energy through the hydrosphere, lithosphere, atmosphere, and biosphere • Energy transformations on global, regional, and local scales • Biogeochemical cycles • Ecosystems • Weather • Climate	**ENV.ES.4a** Describe how ocean currents and patterns relate to climate.	**ENV.ES.4b** Follow surface and ground water flow patterns and movement.	**ENV.ES.4c** Recognize that the hydrosphere is the water portion of Earth.	• Trace the hydrologic cycle in different regions around the Earth and show how it impacts climate. • Use the National Oceanic and Atmospheric Administration, NOAA, site to track ocean water temperatures around the Earth and demonstrate how this impact ocean currents. • Identify the living and nonliving portions of the environment that are impacted by pollution (e.g.,habitat reduction, acid rain, algae blooms, fish kills). • Follow the runoff of fertilizer from a farm into a lake and identify the outcomes that may result (e.g., algae blooms, fish kills). • Follow the water flow through a region and determine points of contamination and follow where the water goes next. • Recognize that groundwater can be contaminated. • Use pictures to identify where groundwater is found. • Use topographic maps to show how water flows through a region. • Identify local bodies of water.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Earth's Resources		
ENV.ER.1 Energy resources • Renewable and nonrenewable energy sources and efficiency • Alternate energy sources and efficiency • Resource availability • Mining and resource extraction	**ENV.ER.1a** Describe the source and benefit of renewable and nonrenewable energy as it relates to resources.	**ENV.ER.1b** Compare renewable and nonrenewable sources of energy (e.g., effectiveness, cost to produce).	**ENV.ER.1c** Sort sources of energy as renewable and nonrenewable.	• List the pros and cons for a variety of energy sources. • Match pictures of renewable and nonrenewable resources with their origins. • Identify where various energy resources originate (e.g., coal, petroleum, wind, water). • Understand that renewable means more can be made is a short period of time. • Understand that nonrenewable means that once it is used there is no way to get more in a reasonable time frame. • List some of Earth's resources as coal, wind, water, petroleum, trees. • Recognize that we power our everyday appliances, devices, and cars with energy produced by Earth's resources.
ENV.ER.2 Air and air pollution • Primary and secondary contaminants • Greenhouse gases • Clean Air Act	**ENV.ER.2a** Identify a consequence and solution to air pollution (e.g., Clean Air Act).	**ENV.ER.2b** Identify a greenhouse gas and how humans have impacted the level of greenhouse gases.	**ENV.ER.2c** Identify types of air pollution.	• Use Google Earth to view a local area to determine what exists in an area and what products are produced and how that impacts an area (e.g., farms, housing developments, industries, nature reserves). • Identify sources of pollution. • Identify greenhouse gases (e.g., carbon dioxide, water vapor) and how they can impact the atmosphere and environment. • Recognize that excess natural materials can be considered pollution. • Recognize that human activities create pollution.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
ENV.ER.3 Water and water pollution • Potable water and water quality • Hypoxia, eutrophication • Clean Water Act • Point source and non-point source contamination	**ENV.ER.3a** Identify a consequence and solution to water pollution (e.g., Clean Water Act).	**ENV.ER.3b** Identify ways that humans have changed the global water supply (e.g., water quality).	**ENV.ER.3c** Identify types of water pollution.	• Use Flint Michigan to illustrate how pollution can impact human water consumption and use. • Identify where contaminants from a stream originate in the area. • Match pictures to point and non-point sources of contamination. • Observe data from a local stream to see what contaminants are present. • Recognize that human activities create pollution. • Recognize that the water used for drinking has to be processed to be used. • Identify what surrounds the water source and how it could impact it. • In your region, identify where your water travels. • In your region, identify where your water originates.
ENV.ER.4 Soil and land • Desertification • Mass movement and erosion • Sediment contamination • Land use and land management (including food production, agriculture, and zoning) • Solid and hazardous waste	**ENV.ER.4a** Identify a consequence and solution of soil pollution (e.g., land use, zoning).	**ENV.ER.4b** Identify ways that humans have contributed to changes in the land (e.g., deforestation, strip mining, waste, etc.).	**ENV.ER.4c** Identify types of soil pollution.	• Explore mitigation projects for reclaiming mining areas (e.g., the Wilds). • Discuss ways that a deforested area can be restored. • Show pictures of how the logging industry has changed an area. • Look at a series of pictures of an area before, during and after a major development project (e.g., riverfront project, building a housing development, stripmine). How has the area changed? What organisms have been impacted? What pollutants were introduced or eliminated? • Recognize that land can be used for a variety of purposes and that use in turn impacts the environment.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
ENV.ER.5 Wildlife and wilderness • Wildlife and wilderness management • Endangered species • Invasive species • Introduced species	**ENV.ER.5a** Explain how a species can become endangered (e.g., deforestation, invasive species).	**ENV.ER.5b** Categorize species as "endangered" or "non-endangered."	**ENV.ER.5c** Identify the meaning of "endangered." species.	• Observe data of endangered populations and examine efforts to restore those populations. • Examine the laws of the nation or local area to protect endangered species. • Use data for the Ohio Department of Natural Resources to monitor that status of a particular species. • Recognize that as organisms' death rate exceeds its birth rate they areconsidered endangered and may become extinct if the conditions do not change. • Recognize that as an environment changes the conditions may become unfavorable for the survival of some organisms.
Global Environment Problems and Issues				
ENV.GP.1 Human population	**ENV.GP.1a** Describe how the size of the human population can have harmful effects on the environment.	**ENV.GP.1b** Identify how the human population has changed over time.	**ENV.GP.1c** Recognize that humans can change their environment globally.	• At the rate of change what could the human population be in the next 100 years. • Use data to show how the human population has change in the last 100 years. • Match events to their outcomes in an environment (e.g., fertilizer runoff causes algae blooms which contaminates water supply). • Identify how humans can impact an area and provide examples. • Identify what caused the biggest changes in that area. • Show a map or pictures of an area that documents the changes over the last 100 years.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
ENV.GP.2 Potable water quality, use, and availability	**ENV.GP.1a** Describe a way to preserve potable water on Earth.	**ENV.GP.1b** Identify a way humans have changed the global water quality.	**ENV.GP.1c** Identify a fresh water source.	• Use an aquarium to show how water can be contaminated and determine how to clean it up. • Show a chart that compares the total amount of water available on the Earth to the amount of freshwater that is available. • Identify activities that impact the water supply (e.g., pollution or remediation). • Recognize that water is processed for human consumption. • Recognize that water is necessary for survival. • Show a picture or map of your local water source.
ENV.GP.3 Climate change	**ENV.GP.3a** Describe a way to preserve our global climates.	**ENV.GP.3b** Identify a possible factor of climate change.	**ENV.GP.3c** Recognize the characteristics of a climate change (e.g., melting glaciers).	• Relate how the polar icecap reduction has impacted populations of organisms that live in that region. • Watch a video of the change in the polar icecaps for the last 25 years. • Recognize ways that can reduce greenhouse gases. • Recognize that climate changes impact the survival rates of organisms. • Recognize that human activity can impact the climate (e.g., increase global temperatures).
ENV.GP.4 Sustainability	**ENV.GP.4a** Explain how resources can be sustained to reduce the impact on Earth (e.g., planting new trees after chopping down others).	**ENV.GP.4b** Identify a resource that should be sustained to positively affect Earth.	**ENV.GP.4c** Sort resources into renewable or non-renewable categories.	• Share the story of the development of the Wilds in Ohio. Guernsey county was used for strip mining and the land was reclaimed and used as a wildlife conservatory. • Discuss how to reduce resource exploitation (renew, reuse, recycle). • Identify ways to protect our valuable resources such as water and air. • Categorize renewable and non-renewable resources.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
ENV.GP.5 Species depletion and extinction	**ENV.GP.5a** Describe why species extinction is harmful to Earth.	**ENV.GP.5b** Identify the cause of a species extinction.	**ENV.GP.5c** Identify a species that has become extinct.	• Watch videos of how Lake Erie water snakes (LEWS) were removed from the endangered species list. This has changed due to public awareness and the introduction of goby fish to the Great Lakes. • Identify an organism within an ecosystem and predict what happens to other parts of the ecosystem with the removal of that organism. (Use the story and data of the moose and wolf populations of Isle Royale to illustrate the codependency of organisms.)
ENV.GP.6 Air quality	**ENV.GP.6a** Describe the effect of air quality on humans.	**ENV.GP.6b** Describe the effect of a pollutant on air quality.	**ENV.GP.6c** Identify a type of air pollution.	• Look at pictures of pollution sources (eg., factories, crowded highways, dust storms) and identify how these sources make air contaminated • Watch videos that show the effects of pollutants on humans (e.g., COPD, asthma); discuss why it is important to keep our air clean • Identify ways that people can reduce air pollution (e.g., drive less, filter factory emissions, use modern farming technique such as no till, purchase local products). • List some things that are not be pleasant to breathe (e.g., dust, cigarette smoke, car exhaust). • Breathe in and out to recognize that fresh air is important to keep us alive and healthy.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
ENV.GP.7 Food production and availability	**ENV.GP.7a** Describe how a factor could limit the availability of food.	**ENV.GP.7b** Describe a factor that can affect food production (e.g., early frost, drought, etc.).	**ENV.GP.7c** Identify oane food production method (e.g., farming, manufacturing).	• Identify events that can damage crops or decrease food production (drought, wind storms, flooding, late frost, insect damage). • Look at population maps or videos to understand how the rapidly increasing human population leads to food scarcity. • Recognize that some food crops are genetically modified to enhance production (e.g., increase yield, internal protection from weeds and insects). • Farmers plant their crops at the same time every year. Predict what would happen if the weather prevented those crops from being planted on time due to flooding or cold temperatures.
ENV.GP.8 Deforestation and loss of biodiversity	**ENV.GP.8a** Identify an effect of deforestation on an ecosystem.	**ENV.GP.8b** Describe the importance of a forest ecosystem.	**ENV.GP.8c** Recognize that having many different organisms in an ecosystem generally leads to a healthier ecosystem.	• Show before and after pictures of an area that has been deforested and discuss what was being harvested and why. • Look at population maps or videos to show how human populations have changed and how this impacts the ecosystem (https://www.youtube.com/watch?v=khFjdmp9sZk).
ENV.GP.9 Waste management (solid and hazardous)	**ENV.GP.9a** Describe a way to reduce solid and hazardous waste.	**ENV.GP.9b** Describe an effect of waste on the environment.	**ENV.GP.9c** Sort types of waste into solid or hazardous waste.	• Show pictures of a landfill and discuss the contents. • Interview the school's custodian and find out what happens to waste produced in the school. • Match pictures of waste materials and their method of removal. • Explore how waste could be reduced. • Identify what makes waste and how it is classified.

Physical Geology

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
Most Complex ⟷ Least Complex				
Minerals				
PG.M.1 Atoms and elements	**PG.M.1a** Identify parts of an atom (e.g., protons, neutrons, electrons).	**PG.M.1b** Identify a diagram or model of an atom.	**PG.M.1c** Identify that all matter is made of atoms.	• Build or recognize a model of an atom including protons, neutrons or electrons. • Identify that protons have a positive charge, neutrons are neutral, and electrons have a negative charge. • Recognize that valence electrons are in the outside layer of an atom. • Identify the valence electrons on a drawing or model on an atom. • Place labels (protons, neutrons, electrons) on a drawing of an atom. • Select the diagram that shows an atom from a set of drawings. • Engage with models or various visual representations of an atom.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
PG.M.2 Chemical bonding (ionic, covalent, metallic)	**PG.M.2a** Represent a chemical compound with a ball-and-stick model or chemical formula.	**PG.M.2b** Recognize that a model (ball-and-stick or molecular geometries) or chemical formula represents a chemical compound.	**PG.M.2c** Identify that two elements combine to form a compound.	• Use an atomic model and/or video to investigate that atoms interact to achieve 8 valence electrons (view the product). • Recognize that different atoms react in different ways (ionic and covalent bonding). • Recognize an ion as an atom that has gained or lost valence electrons (which changes their electrical charge). • Recognize that ionic bonding is an attraction between oppositely charged ions. • Recognize that in covalent bonding atoms share valence electrons so that each have 8. • Identify common minerals that are bonded ionically and covalently. • Recognize that an atom's reactivity is based on its valence electrons. • Identify the valence electrons on a drawing or model on an atom. • Recognize that valence electrons are in the outside layer of an atom. • Engage with a model of an atom to locate the valence (outermost) electrons.
PG.M.3 Crystallinity (crystal structure)				Complex and advanced learning standards in Ohio's New Learning Standards are not included in the extended standards.
PG.M.4 Criteria of a mineral (crystalline solid, occurs in nature, inorganic, defined chemical composition)	**PG.M.4a** Match minerals with rock types in which they are commonly found.	**PG.M.4b** Identify a common mineral in a common rock.	**PG.M.4c** Recognize that minerals can be found in rocks.	• Use a crystal growing kit to illustrate how crystals form. • Examine a variety of rocks and note the size of the crystals in the structure. • Watch videos that show how minerals are formed in a variety of rocks.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
PG.M.5 Properties of minerals (hardness, luster, cleavage, streak, crystal shape, fluorescence, flammability, density/specific gravity, malleability)	**PG.M.5a** Sort minerals by cleavage, streak, hardness and fracture.	**PG.M.5b** Identify hardness and fracture as two characteristics to identify a mineral.	**PG.M.5c** Match minerals by properties (e.g., cleavage, streak, magnetism).	• Investigate a sample rock and determine its identity by testing its properties. • Match a sample rock to its origin given a set of characteristics (e.g., using pictures, maps, illustrations, etc.). • Manipulate rocks to identify textural characteristics of each. • Engage with rocks by feeling the surface of each.
Igneous, Metamorphic and Sedimentary Rocks				
PG.IMS.1 Igneous • Mafic and felsic rocks and minerals • Intrusive (igneous structures: dikes, sills, batholiths, pegmatites) • Earth's interior (inner core, outer core, lower mantle, upper mantle, Mohorovičić [Moho] discontinuity, crust) • Magnetic reversals and Earth's magnetic field • Thermal energy within Earth • Extrusive (volcanic activity, volcanoes: cinder cones, composite, shield) • Bowen's Reaction Series (continuous and discontinuous branches)	**PG.IMS.1a** Compare how different environments change the type of igneous rock that is formed.	**PG.IMS.1b** Describe the properties of igneous rocks.	**PG.IMS.1c** Identify environments in which igneous rocks are formed.	• Look at samples of igneous rock (e.g., granite, basalt), identify differences and recognize that they were formed in different environments. • Identify that granite makes up much of continental crust and basalt makes up much of our ocean floors. • View images or videos of volcanoes at various locations (e.g., edges of continents, mid-ocean spreading centers, hotspots). • Recognize that the cooled lava from volcanoes forms igneous rock (e.g., Hawaii). • View videos of volcanoes erupting.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
PG.IMS.2 Metamorphic • Pressure, stress, temperature, and compressional forces • Foliated (regional), non-foliated (contact) • Parent rock and degrees of metamorphism • Metamorphic zones (where metamorphic rocks are found)	**PG.IMS.2a** Compare how different environments change the type of metamorphic rock that is formed.	**PG.IMS.2b** Describe the properties of metamorphic rocks.	**PG.IMS.2c** Identify environments in which metamorphic rocks are formed.	• Look at samples of metamorphic rocks and the rocks they formed from (e.g., slate from shale, marble from limestone), note the differences and similarities • Recognize that heat and pressure cause things to change. (e.g., examine a slice of white bread (crust removed), describe its properties, roll and squish it into a small ball, describe how its properties have changed, relate this to metamorphic rocks changing from other existing rocks (heat and pressure from your hand).
PG.IMS.3 Sedimentary • Division of sedimentary rocks and minerals (chemical, clastic/physical, organic) • Depositional environments	**PG.IMS.3a** Compare how different environments change the type of sedimentary rock that is formed.	**PG.IMS.3b** Describe the properties of sedimentary rocks.	**PG.IMS.3c** Identify environments in which sedimentary rocks are formed.	• Predict what would happen if lots of pressure squeezed the sediments (they would cement together). • Describe locations where sedimentary rocks can form (e.g., desserts, oceans). • Build a model of the formation of sedimentary rock (e.g., shake sand and dirt in a jar of water, let it sit and describe what happens (settles to the bottom), relate this to sediments falling to the bottom of an ocean).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
PG.IMS.4 Ocean • Tides (daily, neap, and spring) • Currents (deep and shallow, rip and longshore) • Thermal energy and water density • Waves • Ocean features (ridges, trenches, island systems, abyssal zone, shelves, slopes, reefs, island arcs) • Passive and active continental margins • Transgressing and regressing sea levels • Streams (channels, streambeds, floodplains, cross-bedding, alluvial fans, deltas)	**PG.IMS.4a** Use data to see how the sea level changes with the tides in a given location.	**PG.IMS.4b** Describe how the tides are controlled by the moon.	**PG.IMS.4c** Identify a reason for a change in sea level. (e.g., tides, currents, waves, etc.).	• Given a tide table, identify the pattern (amount of time) that occurs between high and low tide and high tide to next high tide. • Watch videos on ocean currents (e.g., NASA, NOAA, Bill Nye) to look at patterns; understand that ocean currents move materials around the ocean and affect the climate on Earth. • View time lapse videos of tides in the ocean, recognize that the water level changes due to the tides. • Recognize that tides are controlled by the gravitational attraction between the moon and Earth. • Engage by watching convection in a tub of water to observe how temperature differences make water move in currents (heat a tub of water under one side only, sprinkle in pepper and watch the circulation pattern).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Earth's History		
PG.EH.1 The geologic rock record • Relative and absolute age • Principles to determine relative age • Original horizontality • Superposition • Cross-cutting relationships • Absolute age • Radiometric dating (isotopes, radioactive decay) • Correct uses of radiometric dating • Combining relative and absolute age data • The geologic time scale • Comprehending geologic time • Climate changes evident through the rock record • Fossil record	**PG.EH.1a** Describe how technology assists in determining the age of rocks (e.g., radiometric dating).	**PG.EH.1b** Identify that in a cross-section of rock, the layer on top is the youngest layer and the layer on the bottom is the oldest (assuming no geological process has shifted the layers).	**PG.EH.1c** Identify changes across layers (cross-section) of rocks.	• Explain that radiometric dating traces radioactive materials in the rock to determine age. • Recognize that there are a variety of methods to determine the age of rock. • Given a cross section of rock determine the relative age in an undisturbed section. • Model the formation of rock layers and relate the age of the layers to the Law of Superposition. • Identify the layers that can be seen within a cross section (e.g., highway cut, Grand Canyon). • Engage with a model of a cross section of a highway cut or rock layers.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Plate Tectonics		
PG.PT.1 Internal Earth • Seismic waves • S and P waves • Velocities, reflection, refraction of waves	**PG.PT.1a** Analyze which earthquake was larger based on a seismographic report or readout.	**PG.PT.1b** Describe how a Richter scale is used as a tool to measure the seismic waves of an earthquake.	**PG.PT.1c** Recognize that a Richter scale is a tool used to measure intensity of earthquakes.	• Recognize that the "wiggles" on the seismograph represents energy waves traveling through Earth. • Given two seismograms choose the one that represents a stronger earthquake. • Compare seismograms, recognize that large "wiggles" mean more shaking of the ground. • Recognize that the Richter scale uses numbers to describe the strength of earthquakes (larger numbers are 10 times stronger than the number before). • Recognize that earthquakes have different strengths. • Watch video footage of small and large earthquakes.
PG.PT.2 Structure of Earth (Note: specific layers were part of grade 8) • Asthenosphere • Lithosphere • Mohorovičić (Moho) boundary • Composition of each of the layers of Earth • Gravity, magnetism and isostasy • Thermal energy (geothermal gradient and heat flow)				Complex and advanced learning standards in Ohio's New Learning Standards are not included in the extended standards.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
PG.PT.3 Historical review (Note: this would include a review of continental drift and sea-floor spreading found in grade 8) • Paleomagnetism and magnetic anomalies • Paleoclimatology				Complex and advanced learning standards in Ohio's New Learning Standards are not included in the extended standards.
PG.PT.4 Plate motion (Note: introduced in grade 8) • Causes and evidence of plate motion • Measuring plate motion • Characteristics of oceanic and continental plates • Relationship of plate movement and geologic events and features • Mantle plumes	**PG.PT.4a** Describe how the continents used to be connected in one super continent of Pangaea and have moved due to tectonic forces.	**PG.PT.4b** Recognize that the shape of the continents is evidence of plate motion (e.g., they fit together like puzzle pieces).	**PG.PT.4c** Identify the crust as the location of the continental plates.	• Recognize that plate motion has caused the continents to shift. Use video footage of Hawaii to illustrate this type of activity. • Use cut outs of the modern continents, try to fit them together like a puzzle, understand that the fact they fit is evidence they were once joined. • Review maps of Earth's continents over the past 300,000 years to identify changes. • Recognize that the surface of Earth has changed. • Identify the name of the previous supercontinent as Pangaea. • Watch a video of a flower blooming or a glacier moving in real time and in fast motion, recognize that sometimes movement is too slow to see.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Earth's Resources		
PG.ER.1 Energy resources • Renewable and nonrenewable energy sources and efficiency • Alternate energy sources and efficiency • Resource availability • Mining and resource extraction	**PG.PT.4a** Identify factors to consider before mining for mineral resources (e.g., cost, pollution, effects on wildlife).	**PG.PT.4b** Identify the effect that mining for a mineral resource has on an area.	**PG.PT.4c** Recognize that minerals are a resource.	• Provide pictures of mining sites and describe the changes to the environment. Describe how those changes impact wildlife. • Understand that renewable means more can be made is a short period of time. • Understand that nonrenewable means that once it is used there is no way to get more in a reasonable time frame. • Recognize that minerals are a nonrenewable resource. • Recognize that minerals are extracted through mining. • Recognize that minerals are used in our everyday materials. • Observe and manipulate various minerals.
PG.ER.2 Air • Primary and secondary contaminants • Greenhouse gases	**PG.ER.2a** Describe how greenhouse gas effects the atmosphere.	**PG.ER.2b** Identify a cause and effect of specific air pollution problem (e.g., smoke from a factory causes haze in the air).	**PG.ER.2c** Identify an air contaminant.	• Identify greenhouse gases (e.g., carbon dioxide, water vapor) and how they can impact the atmosphere and environment. • Use Google Earth to view a local area to determine what exists in an area and what products are produced and how that impacts an area (e.g., farms, housing developments, industries, nature reserves). • Identify an effect of a primary and secondary contaminant. • Identify sources of air pollution. • Recognize when there is a change in the air (hot, cold, odor, scent, humid). • Engage with the air by taking a deep breath and exhaling.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
PG.ER.3 Water • Potable water and water quality • Hypoxia, eutrophication	**PG.ER.3a** Describe why it is important to have clean drinking water.	**PG.ER.3b** Identify a water contaminant.	**PG.ER.3c** Identify a drinking water source.	• Sort water sources as potable and nonpotable. • Describe characteristics of potable and nonpotable water or factors that make it potable/non potable. • In your region, identify where your water originates. • Recognize that the water used for drinking has to be processed to be used. • Recognize that some water is potable and some is not. • Identify various sources of water. • Actively participate in a discussion about water that is good for drinking versus water that would not be.
PG.ER.4 Soil and sediment • Desertification • Mass wasting and erosion • Sediment contamination	**PG.ER.4a** Describe how erosion can change an environment.	**PG.ER.4b** Identify a reason for erosion.	**PG.ER.4c** Define erosion as the movement of Earth's materials.	• Identify the agents of erosion. • Recognize a landform or area that resulted from erosion. • Examine before and after images of erosion. • Observe erosion (video) in action.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Glacial Geology		
PG.GG.1 Glaciers and glaciation • Evidence of past glaciers (including features formed through erosion or deposition) • Glacial deposition and erosion (including features formed through erosion or deposition) • Data from ice cores • Historical changes (glacial ages, amounts, locations, particulate matter, correlation to fossil evidence) • Evidence of climate changes throughout Earth's history • Glacial distribution and causes of glaciation • Types of glaciers: continental (ice sheets, ice caps), alpine/valley (piedmont, valley, cirque, ice caps) • Glacial structure, formation, and movement	**PG.GG.1a** Describe land features that were formed through either erosion or deposition from glaciers.	**PG.GG.1b** Identify land features in Ohio that were formed by glaciers.	**PG.GG.1c** Identify that glaciers consist mainly of ice.	• Use a map to trace the movement of glaciers globally for the last 20 years. • Identify features on a map that are a direct result of glaciation (e.g., the Great Lakes, glacial grooves on Kelleys Island). • Use pictures to identify the different kinds of glaciers (e.g., valley, piedmont, glaciers, cirque, tidewater). • Look at a series of pictures from around Ohio, sort them into glaciated and unglaciated areas. • Actively engage in an activity that demonstrates movement and effects of a glacier. Push a large ice cube across a container of sand, dirt and pebbles, to recognize that ice blocks (glaciers) can move materials. Push down to make the ice cube dig a hole in the sand, relate this to the formation of the Great Lakes.

Physics

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
Most Complex ←				→ Least Complex
		Motion		
P.M.1 Motion Graphs • Position vs. time • Velocity vs. time • Acceleration vs. time	**P.M.1a** Complete a motion graph by indicating the sections where the object is speeding up, moving at constant speed, and slowing down.	**P.M.1b** Label areas of different motion on a motion graph.	**P.M.1c** Identify the motion of an object in a motion graph.	• Use a motion sensor to generate a motion graph of a toy car going down a ramp or a person's movement across a room. Describe the motion indicated by the graph. • Match cards (e.g., moving at a constant speed, speeding up, slowing down) to sections of a speed vs. time graph. • Match cards (e.g., standing still, moving forward, moving backwards, moving quickly, moving slowly) to sections of a position vs. time graph. • Recognize that the y-axis of a speed vs. time graph indicates speed. • Recognize that the y-axis of a position vs. time graph indicates location. • Recognize that the x-axis of a motion graph indicates time elapsing. • Identify the information that a motion graph reveals (e.g., standing still, moving forward/backwards, moving quickly/slowly, speeding up/slowing down). • Recognize that motion can be represented on a graph.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
P.M.2 Problem Solving • Using graphs (average velocity, instantaneous velocity, acceleration, displacement, change in velocity) • Uniform acceleration including free fall (initial velocity, final velocity, time, displacement, acceleration, average velocity)	**P.M.2a** Use graphs to show that the free fall acceleration rate of varying objects, with negligible air resistance, is the same.	**P.M.2b** Make a prediction of the fall rate of two objects that have significantly different mass and surface area.	**P.M.2c** Drop two objects that have significantly different mass and surface area (e.g., a bowling ball and a feather) and make observations.	• Use computer simulations to produce graphs of various objects falling with negligible air resistance. Compare the graphs and show that they all accelerate at the same rate. • Drop an object and time how long it takes to fall to the floor, suggest and test a change to the object that will make it fall more slowly (e.g., parachute, wings). Test the modification and describe increased air resistance is causing the object to fall more slowly. • Watch a video of two objects falling in a vacuum and describe that the acceleration rate (due to gravity) is the same for both because there is no air resistance. • Compare the fall rate of objects that have the same mass but different surface areas (e.g., a paper flat, one wadded up and one folded into fourths) by dropping them at the same time. Explain that air resistance affects the rate of falling. • Predict which of two objects will fall fastest. Test the prediction. • Drop objects and time how long they take to fall to the floor.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
P.M.3 Projectile Motion • Independence of horizontal and vertical motion • Problem-solving involving horizontally launched projectiles	**P.M.3a** Determine whether a ball needs to be thrown higher (vertical) or farther (horizontal) for it to land in a designated area (e.g., in a hoop or on an "x" on the ground).	**P.M.3b** Identify the horizontal and vertical motions of a projectile.	**P.M.3c** Recognize that projectiles have movement in both horizontal and vertical directions.	• Use video simulations (such as cannon launch labs like https://phet.colorado.edu/en/simulation/projectile-motion) to change factors and see how they affect projectiles. Make an accurate prediction about the effect of a change in launch position. • Measure the distance a projectile (launched straight forward) falls and compare this to the distance it falls if dropped and when launched harder. Notice that these vertical distances are all the same. Explain that the vertical motion of a projectile does not depend on its horizontal motion. • Observe a graph (or drawing) of the path of a projectile to see that it is a curved line. Identify the horizontal and vertical changes on the graph. • Launch a projectile and describe that it moves both horizontally (goes forward) and vertically (falls). • Define vertical and horizontal.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Forces, Momentum and Motion		
P.F.1 Newton's Laws Applied to Complex Problems	**P.F.1a** Recognize that momentum is conserved in a collision.	**P.F.1b** Demonstrate Newton's Third Law: for every action, there is an equal and opposite reaction.	**P.F.1c** Identify the direction of an object's motion after it collides with another moving object.	• Explain that the total momentum of a system of objects is the same before and after they collide. • Design a demonstration that shows momentum being transferred. • Explain that when two objects collide momentum can be transferred from one object to another. • Calculate the momentum of an object by multiplying its mass by its velocity. • Add arrows (can be cards) to a picture (e.g., boy pulling wagon, bat hitting ball) to show that each object exerts a force on the other object and that the forces are the same size but in opposite directions. • Explain that you can represent a force by an arrow that shows the direction and size of a force (longer arrows mean greater force). • Use Newton's Third Law to identify that an object pulls or pushes back whenever you pull or push on it (e.g., pull on a rope tied to a stationary object to feel action/reaction forces; explain when you exert a force on the rope the rope exerts an equal force back on you which you can feel as the rope pulling you). • Recognize that when you sit on a chair you are pushing down on the chair and the chair is holding you up. • State a general rule for what happens when two moving objects collide. • Roll two balls, carts or toy cars toward each other and describe their motions after colliding. • Roll the ball from different angles and describe how the direction that the second ball moves changes. • Roll a ball into a stationary ball and describe what happens to the motion of the balls (first one slows down, second one starts moving).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
P.F.2 Gravitational Force and Fields	**P.F.2a** Explain the relationship between mass and gravitational pull.	**P.F.2b** Recognize that gravity is the force that keeps planets and satellites in circular orbits	**P.F.2c** Identify gravity as a force.	• Explain that more massive objects exert greater gravitational forces (e.g., Earth pulls on an object more than the moon does). • Describe that gravity from the sun makes planets travel in circles and that Earth's gravity does the same to satellites including our moon. • Recognize that circular motion requires a force toward the center of the circle (e.g., whirl a wiffle ball tied to a string in a circle and watch what happens if you release the string, observing appropriate safety precautions). Describe that your hand was exerting an inward force on the string. • Identify that the force of gravity moves things (e.g., water flowing down a river, fruit falling from trees, balls rolling down ramps). • Describe that objects fall because of the force of gravity.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
P.F.3 Elastic Forces	**P.F.3a** Design a device that would propel an object using elastic materials (e.g., rubber band cars).	**P.F.3b** Make a prediction of the elasticity of two significantly different elastic materials.	**P.F.3c** Manipulate a variety of elastic bands and other elastic materials and make observations (e.g., rubber bands, hair bands).	• Design a device that uses elastic forces to propel an object. • Manipulate elastic objects (e.g., balloons, physical therapy bands, bungee cords) and describe that the further each is stretched the harder it is to keep stretching them (observe safety considerations). • Identify a way an elastic object could be used to make an object move. • Given two dissimilar objects, predict which one will stretch the most. • Recognize that not all elastic objects stretch the same amount (e.g., use a variety of different fabrics (denims), rubber bands or bungee cords to illustrate this point). • Distinguish elastic from non-elastic objects. From a set of objects (or images) select the items that are elastic objects. • Recognize that things which can stretch are elastic objects.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
P.F.4 Friction Forces (Static and Kinetic)	**P.F.4a** Organize the surface types from "causes the most friction" (most difficult to push) to "causes the least amount of friction" (easiest to push).	**P.F.4b** Investigate friction as it relates to moving an object (e.g., sliding furniture over different types of flooring).	**P.F.4c** Recognize that diverse surface types cause friction differently.	• Define static friction as contact between two stationary surfaces which must be overcome to start an object moving. • Define kinetic friction as contact between two moving surfaces. • Order a given set of surfaces from produces the most friction to produces the least friction. • Identify a way to move a heavy cabinet across a floor (adding wheels, sliding on a blanket). • Identify ways to make a surface easier to slide across (sanding, adding a lubricant). • Describe how different surfaces result in different amount of friction (e.g., slide a block down a ramp with different surfaces (wood, plastic, vegetable oil on the surface, sandpaper) to observe differences in speed)). • Explain that frictions slows moving objects.
P.F.5 Air Resistance and Drag	**P.F.5a** Through investigation, determine the rate of fall of an object in air and a variety of liquids.	**P.F.5b** When given an object, make a prediction of its motion and rate of fall when dropped in the air and a variety of liquids.	**P.F.5c** Drop the same object in air and into a variety of liquids with different viscosity and make observations (e.g., oil, honey, and water).	• Explain how air resistance and drag affect the motion of objects moving through fluids (e.g., boats, kites, swimmers, airplanes). • Explain how air resistance and drag affect the motion of falling objects. • Describe which types of fluids allow materials to pass through them most easily. • Describe air resistance and drag as forces that slow objects moving in fluids (liquids and gases). • Drop a marble through various fluids (e.g., air, oil, syrup, water) and time how long it takes each to fall an equal distance.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
P.F.6 Forces in Two Dimensions • Adding vector forces AND **P.F.7** Momentum, Impulse, and Conservation of Momentum • Motion down inclines • Centripetal forces and circular motion	**P.F.6-7a** Identify the force that, if removed from an object moving in a circular motion, would cause the object to move in a straight line.	**P.F.6-7b** Indicate the direction of the centripetal force of an object moving in a circular motion (e.g., ball being swung on a string).	**P.F.6-7c** Recognize that gravity is the force that creates motion down an incline.	• Describe what occurs when the force acting toward the center of a circle is removed (e.g., watch videos such as https://www.youtube.com/watch?v=dxmedyNZ_8s that show what happens when a centripetal force is removed). • Given objects in circular motion (e.g., ball on string, planet in orbit, ferris wheel) identify the agent and direction of the force causing each circular motion. • Identify the force of gravity as the agent causing things to move down inclined surfaces . • Identify examples of objects and substances moving down inclines (e.g., water flowing down a river, sled sliding down a hill, balls rolling down ramps). • Define an incline as a sloped surface. • Engage with inclined planes by exploring the motion a various objects down a slope.
Energy				
P.E.1 Gravitational Potential Energy	**P.E.1a** Explain that when two attracting objects are at a distance from each other there is gravitational potential energy present.	**P.E.1b** Describe that the gravitational force between two objects depends on the distance between them and their masses.	**P.E.1c** Identify ways people use energy	• Describe that gravitational potential energy exists as a field around attracting objects. As the distance between objects is increased energy is transferred into the field and potential energy increases. As the distance between objects is decreased energy is transferred out of the field and potential energy decreases. • Recognize that when two interacting objects are at a distance from one another gravitational potential energy exists. • Describe the relationship between distance and gravitational force (closer objects exert more force). • Describe the relationship between size and gravitational force (larger objects exert more force). • Explain that all objects exert a gravitational force.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
P.E.2 Energy in Springs	**P.E.2a1** Given a spring stretched various amounts, identify when it has the most potential energy. AND **P.E.2a2** Identify a real-world scenario where the use of a spring might improve the efficiency or performance of a tool.	**P.E.2b1** Compare the distance that two different springs can stretch or can be compressed. AND **P.E.2b2** Investigate how the use of a spring can improve the efficiency of a tool (e.g., a shock absorber in a car or a ball point pen).	**P.E.2c1** Manipulate a variety of springs and make observations (e.g., from inside of a ball point pen, from toys). AND **P.E.2c2** Identify where springs are used in everyday life.	• Identify a location in the real-world where the addition of a spring could improve the function of a tool. • Design a way to use a compressed spring to move an object (e.g., launcher in a pinball machine). • Describe that some springs are more easily compressed than others (e.g., investigate various springs). • Identify that stretched or compressed springs have elastic potential energy (i.e., can do work). • Identify objects that you use in daily activities that contain springs (e.g., beds, cars, pens, toys). • Recognize that a coiled material is a spring.
P.E.3 Work and Power	**P.E.3a** Chart the relationship between work and power.	**P.E.3b** Describe the relationship between work and power (pedaling a bicycle, lifting different weights). More work in a shorter period of time equals more power.	**P.E.3c** Identify work being done.	• Compare graphs of work vs. time for two machines or situations. Identify the steeper slope as having more power. • Calculate power by dividing the work done by the amount of time needed to do that work. • Describe a way to increase the power of a machine (e.g., pedal a bicycle faster because more work is being done during each minute of time). • Identify that power is work done per unit of time. • Calculate work by multiplying force by the distance moved. • Explain that work is done when something is moved a distance by a force (except when the motion and the force are at right angles to each other).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
P.E.4 Conservation of Energy	**P.E.4a**.Given situation, describe where the energy has gone (e.g., a car rolling down hill has energy changing from potential to kinetic).	**P.E.4b** Explain that energy changes forms but the total amount is the same before and after a transfer.	**P.E.4c** Identify that energy cannot be created or destroyed.	• Given a situation involving energy transfer and/or transformation explain the flow of energy in the system. • Identify that when heat is transferred to the air it is not gone, but that it is no longer usable in the system. • Explain that the energy from objects slowing down is not disappearing because the friction when two substances move against each other changes kinetic energy to heat which dissipates into the environment. • Recognize that heat energy can transfer into the environment around a system (e.g., air) and no longer be noticeable. • Explain that friction always changes some energy to heat (e.g., rub hands together to feel heat generated from friction). • Describe that there is always the same amount of energy before and after a change. • Describe that energy can change form or location but is not created or destroyed (e.g., investigate energy transformations in systems such as electric circuits or balls colliding to see that energy changes location or changes from one form to another, but still exists).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
P.E.5 Nuclear Energy	**P.E.5a** Identify types of nuclear energy (e.g., fission and fusion).	**P.E.5b** Describe ways people use nuclear energy.	**P.E.5c** Identify nuclear energy as a type of energy.	• Define nuclear fission as breaking a nucleus and nuclear fusion and combining two nuclei. • List some ways humans use nuclear energy (e.g., power submarines, generate electricity, nuclear medicine). • Trace or describe the changes nuclear power plants use to capture the energy released when a nucleus breaks apart and use it to generate electricity. • Describe that nuclei are being combined in stars (including our sun). • Identify that the energy in the nucleus is transferred to a new location when a nucleus is broken or two nuclei are combined. • Define nuclear energy as energy stored in the nucleus of an atom.
Waves				
P.W.1 Wave Properties • Conservation of energy • Reflection • Refraction • Interference • Diffraction	**P.W.1a** Compare the speeds at which light waves travel in different mediums.	**P.W.1b** Identify what results from light traveling into a different medium (e.g., dispersion into colors – prism, apparent location of a pencil is different from actual location - water).	**P.W.1c** Identify the reflection of light in a mirror.	• Describe the relationship between the medium light is passing through and its speed. Recognize that light travels fastest in a vacuum. • Explain why a stick looks crooked in a glass of water. • Describe that white light is made of a variety of colors of light (e.g., manipulate prisms to see the separation of white light as it passes from air to glass and back to air). • Describe different reflected images (e.g., examine mirrors to see the reflections produced). Compare and contrast the images with the original objects, describing, size, orientation and distance from mirror.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
P.W.2 Light Phenomena • Ray diagrams (propagation of light) • Law of reflection (equal angles) • Snell's law • Diffraction patterns • Wave – particle duality of light • Visible spectrum and color • Visible spectrum and color	**P.W.2a** Create a ray diagram showing the path of a light wave.	**P.W.2b** Complete a simple ray diagram to show at what angle a wave is reflected off a surface.	**P.W.2c** Identify a ray diagram.	• While observing a light beam interacting with a lens or mirror, construct or select a ray diagram that depicts the observations. • Given a partially completed ray diagram showing light passing through a lens fill in the missing ray(s) (could select from a set of options). • Given a partially completed ray diagram showing light reflecting off a mirror fill in the missing ray (could select from a set of options). • Describe that different lenses affect light in different ways (e.g., investigate the path of light as it passes through a variety of lenses). • Identify that light reflects at the same angle it enters a mirror (e.g., shine a laser pointer into a mirror at different angles and see where it reflects). • Given a ray diagram, trace the path of light from its source to where it exits the diagram. • Recognize that a ray diagram is a way to show the path of light using arrows.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Electricity and Magnetism		
P.EM.1 Charging Objects (Friction, Contact, and Induction)	**P.EM.1a** Recognize that charges can transfer from one object to another in different ways.	**P.EM.1b** Understand that objects can have charges which can be either negative or postitive.	**P.EM.1c** Relate the symbols (+, -) to their corresponding charge.	• Give examples of different ways charges can move (e.g., touching a metal surface, feet rubbing on carpet, a static charged balloon held near hair). • Explain that electrons can move from one object to another when they are rubbed together (e.g., rubbing a balloon on hair, rubbing a glass rod with silk) and that one object will end up with a positive charge and the other with a negative charge • Describe that electrons have a negative charge and are located in the outer portions of atoms. • Identify that opposite charges attract each other. • Recognize that a minus sign (-) is used to show a negative charge. • Recognize that a plus sign (+) is used to show a positive charge.
P.EM.2 Coulomb's Law				Complex and advanced learning standards in Ohio's New Learning Standards are not included in the extended standards.
P.EM.3 Electric Fields and Electric Potential Energy	**P.EM.3a** Recognize the effect of an electric field around a positively or negatively charged object (e.g., like charges repel, and opposite charges attract).	**P.EM.3b** Label a model or picture indicating an electric field.	**P.EM.3c** Identify a field as an area around an object.	• Explain that an electric field can exist around an object (e.g., bring a balloon that has been rubbed on hair near small pieces of paper to observe that an electric field exists around the balloon). • Describe how the effect of an electric field varies depending on the charge of the object that enters the field (like charges repel and unlike charges attract). • Recognize that an electric field can cause a change to objects brought into the field (e.g., makes paper shreds move).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
P.EM.4 DC Circuits • Ohm's law • Series circuits • Parallel circuits • Mixed circuits • Applying conservation of charge and energy (junction and loop rules)	**P.EM.4a** Construct a direct current circuit.	**P.EM.4b** Identify the required parts of a circuit.	**P.EM.4c** Complete a direct current circuit (e.g., closing a switch to initiate flow).	• Explain that not all circuits behave exactly alike (e.g., observe the brightness of the bulb in a simple circuit, see how the brightness changes if a second bulb is added in series or in parallel). • Given materials construct a circuit which operates an electric device (e.g., light bulb, motor, buzzer). • Explain that a circuit requires a complete path (closed loop) of conducting materials. • Define materials which transfer electricity easily (metals) as conductors. • Identify the requirements of a complete current circuit. (e.g., observe or construct a circuit with a battery, wires, a bulb and a switch, see what happens as the switch is opened and closed).
P.EM.5 Magnetic Fields	**P.EM.5a** Apply a real-life example demonstrating the strength of magnetic fields (e.g., explore how many paper clips a weak magnet can hold up versus a strong magnet).	**P.EM.5b** Demonstrate that different magnets have different sized magnetic fields.	**P.EM.5c** Manipulate two objects displaying magnetism.	• Describe that flowing electricity can produce a magnetic field (e.g., electromagnet). • Explain that different magnets produce different magnetic fields (e.g., use paper clips to investigate how far away from a magnet the paperclip can be and still be pulled to the magnet comparing various magnets). • List products in the home that contain magnets (e.g., computers, motors, stud finders, purse clasps, cell phones, refrigerator magnets). • Manipulate a variety of magnets and identify that magnets can have different strengths.
P.EM.6 Electromagnetic Interactions				Complex and advanced learning standards in Ohio's New Learning Standards are not included in the extended standards.

Anatomy and Physiology

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
Most Complex ←				→ Least Complex
Levels of Organization				
AP.LO.1 Hierarchy of Organization	**AP.LO.1a** Describe the function of organ systems (e.g., muscular, skeletal, digestive, nervous, respiratory, reproductive, digestive).	**AP.LO.1b** Recognize the hierarchy of cellular organization (i.e., cells make tissues, tissues make organs, etc.).	**AP.LO.1c** Identify a cell.	• Name either cells or organs that are a part of the various systems of the body (e.g., cardiac cells make up the heart which are part of the circulatory system). • Identify the functions of the body and the organs/organ systems that are responsible for that function. • Sequence cards showing cell, tissue, organ and system into order from simplest to most complex. • Recognize that cells can work together. • From a group of photos, select the ones that show cells. • Identify that cells make up the human body. • Engage with pictures or visual models of cells, organs, and organ systems.
AP.LO.2 Types of Tissues	**AP.LO.2a** Describe the function of a particular type of tissue (e.g., muscle tissue).	**AP.LO.2b** Recognize that there are different types of tissues with different functions.	**AP.LO.2c** Identify that tissues are made of cells.	• Name either cells or organs that are a part of the various systems of the body (e.g., cardiac cells make up the heart which are part of the circulatory system). • Look at images of various types of tissues and match them to organs where possible (e.g., cardiac and smooth tissue). • Match types of tissues to their function. • Match pictures of cell types to their related tissue. • Identify that tissues are made of cells. • Engage with visuals showing the composition of various types of tissues (e.g., many skin cells make up skin tissue). • Engage with models of cells.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
AP.LO.3 Homeostasis	**AP.LO.3a** Describe how the body works to maintain homeostasis (e.g., sweating when the body is hot).	**AP.LO.3b** Recognize that the body's systems interact to maintain balance.	**AP.LO.3c** Identify that the body has many systems that work together.	• Recognize that different parts of the body work together to maintain homeostasis (e.g., circulatory system works to support many systems, . Iincreased heart rate increases blood circulation which imports and exports materials as needed to maintain a healthy range). • Recognize that if sweating increases, water will need to be replaced. • Recognize that if more water is consumed, urination increases. • Identify why you drink more water when consuming salty foods.. • Compare heart rate and breathing when sitting versus running. Discuss why there is a difference. • Describe why you start to sweat or to shake, recognize these are your body trying return to its proper balance. • Describe a time when you had a fever, use this to understand that the body needs to stay at a certain temperature range. • Actively participate in discussion of body functions including purpose of sweating, shivering, and why heart rate may increase.
AP.LO.4 Anatomical Terminology	**AP.LO.4a** Label organs on a model or image of a body.	**AP.LO.4b** Match organ names to a model or image.	**AP.LO.4c** Locate a body part on a model or image of a body.	• Identify body parts and connect to anatomical terminology. • Observe a labeled representation of a body and its organs. • Recognize that the human body has universal terminology for orientation. • Engage with a model of the human body (torso, internal organs).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Support and Motion		
AP.SM.1 Integumentary System	**AP.SM.1a** Identify the accessories of the skin system (e.g., nails, hair follicles, sweat glands).	**AP.SM.1b** Identify the functions of skin (e.g., protection, temperature regulation).	**AP.SM.1c** Identify skin as a form of protection.	• Recognize that skin aids in homeostasis. • Match labels to parts of the skin (e.g., hair follicles, sweat glands, nerves, blood vessels) • View enlarged images of the skin, see that it has layers and parts which aid in protection. • List or select ways your skin protects you (e.g., keeps germs out, shields the body from radiation, sweats to maintain temperature, eliminates waste products). • Recognize that your skin is a barrier which is protection. • Actively participate in discussion of characteristics of own skin. • Engage in touching own skin.
AP.SM.2 Skeletal System	**AP.SM.2a** Describe the functions of the skeletal system (support, protection, movement).	**AP.SM.2b** Complete a model of a skeleton using the major bones of the body.	**AP.SM.2c** Match major bones with a diagram of a body (e.g., skull=head).	• List or select the functions of the skeleton (helps you move, supports the body, protects organs). • Create a model of a skeleton using the major bones of the body. • Match body parts with the bones that are associated with them (head/skull, long bone/extremities, rib cage/chest, tiny bones/fingers and toes) • Recognize that bones in different parts of the body look different to provide different functions (primarily support). • Engage with a visual model of the skeletal system.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
AP.SM.3 Muscular System	**AP.SM.3a** Describe how muscles are needed for movement.	**AP.SM.3b** Recognize that some muscle movements are voluntary (e.g., walking) and some are involuntary (e.g., beating heart).	**AP.SM.3c** Identify a muscle.	• Bend your arm and leg in and out, notice that voluntary muscles often work in pairs. One muscle relaxes and the other contracts. • Sort muscles as voluntary or involuntary based on function. • Identify the location of muscles that work involuntarily (e.g., heart, blood vessels, digestive system). • Recognize that some muscles move on their own (e.g., involuntary). • Recognize that different muscles types provide different functions (e.g., smooth muscles for digestion, striated muscles for walking, cardiac muscle for heartbeat). • Recognize the substance underneath the skin is muscle and t. That muscles areis attached to the bones of the skeletal system. • Engage with pictures of the muscular system (e.g., look at pictures of different muscle types (cardiac, smooth, skeletal)). • Engage in moving parts of the body and feeling muscular structures underneath skin.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Integration and Coordination		
AP.IC.1 Nervous System	**AP.IC.1a** Explain how the nervous system controls all of the functions of the body and that it is made up of the brain, spinal cord, and nerves of the body.	**AP.IC.1b** Identify a function of the nervous system (e.g., muscle control, memory, sensory perception, emotions, speech, balance, and basic life functions like breathing).	**AP.IC.1c** Identify that the nervous system consists of the brain, spinal cord, and nerves.	• Communicate about something that happened to you in the past, explain that your brain stored that memory. • Sort actions into things your body does automatically (e.g., breathe, digest) and things you have to think about (e.g.,roll over, throw a ball). • Recognize that the brain coordinates all the parts and functions of the body. • Identify the skull as what protects your brain and describe injuries that could affect your skull/brain (e.g., concussion from sports, car accident, riding bike without a helmet, diving into shallow water). • Identify where in the body your brain is located. • Recognize a picture of the brain. • Engage with a model of a brain or pictures of the brain, spinal cord, and nerves.
AP.IC.2 Special Senses (Sense of Sight, Senses of Hearing and Balance, Senses of Taste and Smell)	**AP.IC.2a** Explain the connection between the senses and involuntary reactions.	**AP.IC.2b** Match each of the five senses to descriptions or images of activities that involve the senses.	**AP.IC.2c** Identify each of the 5 senses using diagrams or pictures (e.g., sight = eyes).	• Recognize that some actions and/or events can cause involuntary reactions. (e.g., cutting onions makes your eyes water). • Match the body organs that are responsible for what you smelled, touched, heard or saw. • Describe how you feel or react to items when you smell, touch, listen to, look at, taste them. • Smell, touch, listen to, look at, taste various items and compare similarities and differences for each. • Identify the five senses. • Match each sense with a body part. (e.g., sight = eyes). • Smell, touch, listen to, look at, taste various items.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
AP.IC.3 Endocrine System	**AP.IC.3a** Recognize that imbalances in the body can lead to diseases (e.g., high blood pressure, diabetes).	**AP.IC.3b** Identify functions of hormones (maintains blood glucose levels, stable blood pressure, body temperature, reproduction).	**AP.IC.3c** Identify that the body produces substances to help bodies grow and develop.	• Recognize that imbalances in the body can lead to diseases (e.g., uUse diabetes as an example for a disease that occurs when hormones are imbalanced). • Recognize that hormones (chemicals) help to promote growth in the body and regulate numerous body functions. • Recognize that hormones regulate body functions from birth to death. • Identify hormones as substances that affect growth, development, and maintenance. • Actively participate in a discussion on growing and developing.
Transport				
AP.T.1 Blood	**AP.T.1a** Describe the specific functions of red blood cells and white blood cells.	**AP.T.1b** Describe the function of blood in the human body (e.g., transportation, protection, and regulation).	**AP.T.1c** Identify the two types of blood cells (e.g., red and white blood cells).	• Identify that white blood cells fight infection. • Identify that red blood cells carry oxygen to the entire body and picks up carbon dioxide to transport back to the lungs. • List or select functions of blood (e.g., carry food, oxygen and wastes, fight infection, maintain balance (homeostasis)). • Observe pictures of red and white blood cells, describe differences in their shapes. • Recognize that there are three different types of blood cells (e.g., red and white, platelets). • Engage in representations of the various components of blood (e.g., red and white blood cells, platelets, plasma, etc.).

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
AP.T.2 Cardiovascular System	**AP.T.2a** Describe the structure and function of the heart.	**AP.T.2b** Identify the heart as a muscle that pumps blood throughout the body.	**AP.T.2c** Locate the heart on a diagram/picture.	• Label a representation of the heart including the chambers. • Relate the cardiovascular system to a delivery system, Blood picks up products and wastes and delivers it to other systems in the body. • Trace the flow of blood through the heart. • Use an ECG/EKG printout to provide a visual representation of a heartbeat. • Recognize the heart is a muscle that pumps blood throughout the body. • Identify the heart when presented with a diagram or picture. • Engage by placing your hand on your heart to feel your heartbeat.
AP.T.3 Lymphatic and Immune Systems	**AP.T.3a** Describe the role of the immune system in fighting disease.	**AP.T.3b** Identify white blood cells as part of the immune system.	**AP.T.3c** Identify a white blood cell.	• Describe the role of the immune system in fighting disease. Relate the immune system to a security system of a house. It constantly monitors the body looking for intruders. Once an intruder is detected, it remembers the intruder and launches a defense each and every time it is encountered. • Recognize that white blood cells are part of the immune system. • Identify a white blood cell. • Recognize that your body uses certain internal structures to fight off diseases when you get sick. • Actively participate ein discussion on how the bodyyou fights illness.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Absorption and Excretion		
AP.AE.1 Digestive System	**AP.AE.1a** Explain how the digestive system functions to allow humans to receive nutrients needed to survive.	**AP.AE.1b** Identify structures used in digestion (e.g., mouth, teeth, tongue, esophagus, stomach, small intestine, large intestine, and rectum).	**AP.AE.1c** Identify a digestive organ in a model or diagram of the body.	• Recognize that as food travels, nutrients and minerals are absorbed in through the intestines back into the body. • Recognize that the stomach breaks food down for digestion. • Using a visual, trace what happens to food after it is consumed (e.g., from the esophagus it travels to the stomach, small and large intestine and out the rectum). • Consume a cracker and document what the mouth does (e.g., teeth chew, saliva increases, tongue pushes food around and back into the esophagus). • Identify the body parts in the mouth (e.g., tongue, teeth, salivary glands). • Identify a digestive organ in a model or diagram in the body. (e.g., mouth, teeth, tongue, esophagus, stomach, small intestine, large intestine, and rectum). • Recognize that specific organs are responsible for digesting food. • Actively participate in discussion about the path your food takes as you eat.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
AP.AE.2 Respiratory System	**AP.AE.2a** Describe how the respiratory system can be damaged by disease or pollutants.	**AP.AE.2b** Identify that breathing is the act of taking in oxygen and expelling carbon dioxide.	**AP.AE.2c** Identify the lungs in a model or diagram of the body.	• Describe how disease and damage affect the respiratory system. • Identify things that can cause lung damage. • Recognize that damage to your lungs can make it hard to breathe. • Observe how breathing changes when exposed to different conditions. (e.g. breathing on a winter day v.s. a hot summer day, breathing after you spray body spray or hair spray). • Recognize carbon dioxide as a waste product expelled by breathing. • Recognize oxygen as the gas required for performing life functions. • Identify the gases involved in respiration (e.g., take in oxygen, expel carbon dioxide). • Recognize that your lungs help you to breathe. (e.g., breath in and out of a paper bag to watch it expand and contract). • Identify the lungs in a model or diagram of the body. • Engage in breathing exercises while using your hand to feel the movement of air from the body.
AP.AE.3 Urinary System	**AP.AE.3a** Describe the main function of the urinary system (e.g., to excrete liquid waste).	**AP.AE.3b** Identify structures of the urinary system (kidneys, bladder, and urethra).	**AP.AE.3c** Identify the kidneys in a model or diagram of the body.	• Trace the path of urine through the body given a diagram. • Identify what lets you know you have to urinate. • Identify what organs are involved when urination occurs. • Use pictures to identify the kidneys. • Identify where urine originates. • Identify what is urine is. • Actively participate in a discussion about what happens when you drink a lot of liquids.

Learning Standard	*Complexity a*	*Complexity b*	*Complexity c*	**Learning Progression** *Building the Base & Engagement*
		Reproduction		
AP.R.1 Reproductive System	**AP.R.1a** Describe the function of the reproductive system (e.g., producing offspring).	**AP.R.1b** Identify structures of the reproductive system in a model or visual representation.	**AP.R.1c** Identify male and female differences.	• Identify functions of reproductive body parts as they relate to being male or female. • Sort reproductive organs as male or female. • Identify the parts of your body that relate to reproduction. • Identify what about your body makes you biologically male or female. • Recognize that you are biologically male or female. • Engage with visual representations of the male and female bodies.

Acknowledgements

The Ohio Department of Education's Office of Curriculum and Assessment and Office for Exceptional Children collaborated to develop the companion document to Ohio Learning Standards-Extended: OLS-E Learning Progressions. A writing committee, comprised of special educators, regular educators, administrators, parents and other stakeholders around the state of Ohio came together to create this companion document.

Ohio Learning Standards-Extended - Learning Progressions would not be possible without the support of all who worked tirelessly to create a guiding tool to support access to the general education curriculum for all students. The following individuals served on our writing committee, providing extensive time, dedication, thought and expertise to this project.

Sincere appreciation goes to:

Marcia Barnhart, ODE Office of Literacy – English Language Arts

Shawna Benson, OCALI – All Subjects

Brian Bickley, ODE Office of Curriculum – Mathematics

Elizabeth Bridges, ODE Office of Curriculum – English Language Arts

Tom Bulgrin, ODE Office of Curriculum – Social Studies

Sarah Buoni, ODE Office for Exceptional Children – English Language Arts and Social Studies

Ann Carlson, ODE Office of Curriculum – Mathematics

Angie Chapple-Wang, State Support Team Region 3 – Science and English Language Arts

Molly Fender, Fiarfield County Board of DD – English Language Arts

Sara Hamilton, Madison - Plains Jr. High – Science

Courtney Handshoe, Madison Local School District - Social Studies

Elizabeth Hess, ODE Office of Literacy – English Language Arts

Andrew Hinkle, ODE Office of Assessment

Shantelle Hill, ODE Office of Curriculum – English Language Arts

Cathy Holmes, ODE Office of Curriculum – Science

Lydia Hunter, ODE Office of Curriculum – Science

Anna Jedick, ODE Office of Curriculum – Mathematics

Stacy Ludwig, ODE Office of Curriculum – English Language Arts

Melissa Weber-Mayer, ODE Office of Literacy – English Language Arts

Linda McKean, ODE Office of Curriculum – Social Studies

Sara Miller, Madison Local School District – English Language Arts and Science

Anika Moore, ODE Office of Curriculum – Mathematics

Yelena Palayeva, ODE Office of Curriculum – Mathematics

Virginia Ressa, ODE Office of Assessment – Social Studies

Cathie Rollings, ODE Office of Assessment

Tara Ruckman, Pickerington Local School District - Mathematics

Finally, thanks to all who provided feedback, support and guidance, technical support, and accessibility features along the way including family and community members, university faculty, school administrators, teachers and others. Ohio's Learning Standards-Extended Learning Progressions would not be possible without the support of all who worked tirelessly to create a guiding tool to support access to the general education curriculum for all students. For additional information contact OCALI's Office of Teaching Diverse Learners at 614.410.0321 or 614.410.0321.