LAKEWOOD CITY SCHOOL DISTRICT STANDARDS-BASED SCIENCE CURRICULUM
SECOND GRADE

GRADE BAND THEME**: Observations of the Environment--** This theme focuses on helping students develop the skills for systematic discovery to understand the science of the natural world around them in greater depth by using scientific inquiry.

Units: 1. **Tremendous Tree Detectives** 2. **Ice Age Detectives** 3. **Water Cycle Detectives** 4. **Forces and Motion**



Table 2: Ohio's Cognitive Demands for Science

COGNITIVE DEMAND	DESCRIPTION
DESIGNING TECHNOLOGICAL/ENGINEERING SOLUTIONS USING SCIENCE CONCEPTS (T)	Requires student to solve science-based engineering or technological problems through application of scientific inquiry. Within given scientific constraints, propose or critique solutions, analyze and interpret technological and engineering problems, use science principles to anticipate effects of technological or engineering design, find solutions using science and engineering or technology, consider consequences and alternatives, and/or integrate and synthesize scientific information.
DEMONSTRATING SCIENCE KNOWLEDGE (D)	Requires student to use **scientific inquiry** and develop the ability to think and act in ways associated with inquiry, including asking questions, planning and conducting investigations, using appropriate tools and techniques to gather and organize data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments. (Slightly altered from National Science Education Standards) **Note: Procedural knowledge (knowing how) is included in *Recalling Accurate Science*.**
INTERPRETING AND COMMUNICATING SCIENCE CONCEPTS (C)	Requires student to use subject-specific conceptual knowledge to interpret and explain events, phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.
RECALLING ACCURATE SCIENCE (R)	Requires student to provide accurate statements about scientifically valid facts, concepts and relationships. Recall only requires students to provide a rote response, declarative knowledge or perform routine mathematical tasks. This cognitive demand refers to students' knowledge of science fact, information, concepts, tools, procedures (being able to describe how) and basic principles.

As with all other frameworks and cognitive demand systems, Ohio's system has overlap between the categories. *Recalling Accurate Science* is a part of the other three cognitive demands included in Ohio's framework, because science knowledge is required for students to demonstrate scientific literacy.

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THE NATURE OF SCIENCE – These skills and understandings should be integrated into grade level content units.

Nature of Science
One goal of science education is to help students become scientifically literate citizens able to use science as a way of knowing about the natural and material world. All students should have sufficient understanding of scientific knowledge and scientific processes to enable them to distinguish what is science from what is not science and to make informed decisions about career choices, health maintenance, quality of life, community and other decisions that impact both themselves and others.

Categories	K-2
Scientific Inquiry, Practice and Applications All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas	● Apply knowledge of science content to real-world challenges. ● Plan and conduct simple scientific investigations using appropriate safety techniques based on explorations, observations and questions. ● Employ simple equipment and tools to gather data and extend the senses. ● Use data and mathematical thinking to construct reasonable explanations. ● Communicate with others about investigations and data.
Science is a Way of Knowing Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past, and they will continue to do so in the future. Science is both a body of knowledge that represents a current understanding of natural systems and the processes used to refine, elaborate, revise and extend this knowledge.	● The world is discovered through exploration. ● Exploration leads to observation. Observation leads to questions. ● Natural events happen today as they happened in the past. ● Events happen in regular patterns and cycles in the natural world.
Science is a Human Endeavor Science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes.	● Everyone explores the world which generates questions. ● The answer is not always as important as the process. ● Questions often lead to other questions. ● Discoveries are communicated and discussed with others. ● People address questions through collaboration with peers and continued exploration. ● Everyone can see themselves as scientists.
Scientific Knowledge is Open to Revision in Light of New Evidence Science is not static. Science is constantly changing as we acquire more knowledge.	● It is essential to learn how to identify credible scientific evidence. ● Ideas are revised based on new, credible scientific evidence.

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Unit 1: Tremendous Tree Detectives

Essential Question: How do trees impact the environment?

Big Idea 1: Living and nonliving parts of the environment are interrelated.
Big Idea 2: Trees cause changes in their environment, and in the temperature of the air.
Big Idea 3: The impact of trees on the environment can be affected by wind power.

Vocabulary: living, non-living, interrelated, basic needs, impact, environment, air, wind, trunk, crown, roots, nutrients, habitat, shelter.

Content Statements	Content Elaboration and Clarification from Model Curriculum	Strategies for Instruction and Assessment + Resource Options
2.LS.1: Living things cause changes on Earth. Living things function and interact with their physical environments. Living things cause changes in the environments where they live; the changes can be very noticeable or slightly noticeable, fast or slow. **Note:** *At this grade level, discussion is limited to changes that can be easily observed.*	**Prior Concepts Related to Interactions within Environments** **PreK-1:** Macroscopic characteristics of living things are observed, including basic survival needs of living things, how living things get resources from the environment and how available resources vary throughout the course of a year. **Grade 2 Concepts** The environment is a combination of the interactions between living and non-living components. Living things can cause changes in their ecosystems, which can be observed. These interactions can cause changes in groups of living things and the physical environment (e.g., soil, rocks, water). Conducting investigations (in nature or virtually) to document specific changes in the ecosystem, as well as the results of those changes, are used to demonstrate this concept (e.g., moles tunneling in a lawn, beavers or muskrats building dams, plants growing in cracks of rocks). Maps or charts can be used to document the location of specific types of living things found in the local area. The impact and actions of living things are investigated and explored. The focus is not limited to human interaction with the environment (such as resource use or recycling) and includes activities such as observing earthworm compost bins, ant farms and weeds growing on vacant lots.	Tremendous Tree Detectives Unit Introduction Tremendous Tree Detectives: Lessons 1.1, 1.2, 2.1, 2.2, 3.1, 4.1, 4.3, 5.1, 5.2 **Exit Tickets:** 1. How do trees affect the environment? 2. How does the environment affect trees?

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	Future Application of Concepts **Grades 3-5:** Changes that occur in an ecosystem can sometimes be beneficial and sometimes harmful. **Grades 6-8:** Matter is transferred constantly from one organism to another and between organisms and their physical environment.	
2.ESS.1: The atmosphere is primarily made up of air. Air has properties that can be observed and measured. The transfer of energy in the atmosphere causes air movement, which is felt as wind. Wind speed and direction can be measured. **Future Application of Concepts** **Grades 3-5:** Renewable energy and air pollution are studied. Wind can weather and erode Earth's surface. **Grades 6-8:** Thermal energy transfers in the atmosphere, causing air currents and global climate patterns.	**Prior Concepts Related to Air and Atmosphere** **PreK-1:** The term energy is introduced in grade 1. Wind is air in motion. Air is a nonliving substance that surrounds Earth. Wind can be measured and sunlight warms the air. **Grade 2 Concepts** In the earlier grades, wind is measured but not with a numerical value or directional data (e.g., wind may be moving faster/slower than yesterday and is coming from a different direction). Wind can change the shape of the land (e.g., sand dunes, rock formations). In grade 2, wind is measured with a numeric value and direction (e.g., wind speed is 6 mph, wind direction is west to east). Air takes up space (volume) and has mass (differentiating between mass and weight is not necessary at this grade level). Heating and cooling of air (transfer of energy) results in movement of air (wind). The direction and speed of wind and the air temperature can be measured using a variety of instruments, such as windsocks, weather vanes, thermometers or simple anemometers. Weather events that are related to wind (e.g., tornadoes, hurricanes) are included in this content. Monitoring weather changes using technology (e.g., posting/sharing classroom data with other classes at the school or at other schools) can lead to review and questioning of data and evaluation of wind patterns that may be documented. Experiments, models (including digital/virtual) and investigations are conducted to demonstrate the properties of air, wind and wind-related weather events. Questions, comparisons and discussions related to actual data and the analysis of the data is an important way to deepen the content knowledge.	Tremendous Tree Detectives: Lessons 4.2, 5.2, 6.1, 6.2 **Exit Ticket:** 1. How can the properties of air be observed and measured?
2.ESS.3: Long- and short-term weather changes occur due to changes in energy. Changes in energy affect all aspects of weather, including temperature, precipitation, and wind.	**Prior Concepts Related to Water in the Atmosphere** **PreK-1:** The term energy is introduced in grade 1. Weather changes during the day and from day to day. Weather changes can be long- or short-term. Weather changes can be measured and have patterns. **Grade 2 Concepts** Weather is a result of energy change. Heating (from sunlight) and cooling of water, air and land are directly related to wind, evaporation, condensation, freezing, thawing and precipitation. Density and convection should not be introduced at this grade level. Weather patterns (long-term) and fronts (short term) can be documented through consistent measuring of temperature, air pressure, wind speed and direction, and	Tremendous Tree Detectives: Lessons 4.4, 5.1 Assessed in the Water Cycle Unit.

	precipitation. Some forms of severe weather can occur in specific regions/areas, scientists forecast severe weather events. Weather data can be measured, collected and documented over a period of time and then connected to observable forms of energy (e.g., wind causes a sailboat to move, the sun can heat the sidewalk). Experiments and investigations (both inside and outside of the classroom) are used to demonstrate the connection between weather and energy. Discussion of energy at this grade level should be limited to observable changes. **Future Application of Concepts** **Grades 3-5:** Changes in energy and changing states of matter are explored in greater depth through applications other than weather. Renewable resources (energy sources) and changes in Earth's environment through time are examined. **Grades 6-8:** Changes of state are explained by molecules in motion, kinetic and potential energy. The hydrologic cycle and thermal energy transfers among the hydrosphere, lithosphere, and atmosphere are studied.	

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Unit 2: Ice Age Detectives

Essential Question: How have living things changed over time?

Big Idea 1: Fossils can tell us about past plants, animals, and climate of an area.
Big Idea 2: Organisms become extinct when their environment no longer provides their basic needs.
Big Idea 3: Some plants and animals that are alive today are similar to those alive in the past, while others are very different from anything alive today.

Vocabulary: Fossil, basic needs, extinction, environment, climate, organism, landscape, Ice Age, glacier, ancient, sediment, minerals, timeline

Content Statements	Content Elaboration and Clarification from Model Curriculum	Strategies for Instruction and Assessment + Resource Options
2.LS.1: Living things cause changes on Earth. Living things function and interact with their physical environments. Living things cause changes in the environments where they live; the changes can be very noticeable or slightly noticeable, fast or slow. **Note:** *At this grade level, discussion is limited to changes that can be easily observed.*	**Prior Concepts Related to Interactions within Environments** **PreK-1:** Macroscopic characteristics of living things are observed, including basic survival needs of living things, how living things get resources from the environment and how available resources vary throughout the course of a year. **Grade 2 Concepts** The environment is a combination of the interactions between living and non-living components. Living things can cause changes in their ecosystems, which can be observed. These interactions can cause changes in groups of living things and the physical environment (e.g., soil, rocks, water). Conducting investigations (in nature or virtually) to document specific changes in the ecosystem, as well as the results of those changes, are used to demonstrate this concept (e.g., moles tunneling in a lawn, beavers or muskrats building dams, plants growing in cracks of rocks). Maps or charts can be used to document the location of specific types of living things found in the local area. The impact and actions of living things are investigated and explored. The focus is not limited to human interaction with the environment (such as resource use or recycling) and includes activities such as observing earthworm compost bins, ant farms and weeds growing on vacant lots. **Future Application of Concepts** **Grades 3-5:** Changes that occur in an ecosystem can sometimes be beneficial and sometimes harmful.	Ice Age Detectives: Lessons 2.1, 3.2 **Exit Ticket:** (from lesson 3.2, step 18) How has ice impacted the plants and animals in Ohio?

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	Grades 6-8: Matter is transferred constantly from one organism to another and between organisms and their physical environment.	
2.LS.2: All organisms alive today result from their ancestors, some of which may be extinct. Not all kinds of organisms that lived in the past are represented by living organisms today. Some kinds of organisms become extinct when their basic needs are no longer met or the environment changes.	**Prior Concepts Related to Interactions within Environments** **PreK-1:** Living things have physical traits, which enable them to live in different ecosystems. **Grade 2 Concepts** Fossils are preserved physical traces of past living things (e.g., shells, bones, leaves, tracks, imprints, eggs, scat). Some fossils look similar to plants and animals that are alive today, while others are very different from anything alive today. Extinction refers to the disappearance of the last individual of a kind of organism. Extinction generally occurs as a result of changed conditions where the basic needs are not met. Some kinds of living things that once lived on Earth have completely disappeared (e.g., saber-tooth cat, trilobite, mastodon). Plants and animals alive today resemble organisms that once lived on Earth (e.g., ferns, sharks). **Future Application of Concepts** **Grade 3-5:** Fossils are addressed in more detail. **Grades 6-8:** This concept is expanded to provide a partial explanation of biodiversity.	Ice Age Detectives: Lessons 1.2, 2.1, 3.1 **Exit Ticket**: Tell me what you know about fossils.

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Unit 3: Water Cycle Detectives

Essential Question: How does the water cycle impact our environment?

Big Idea 1: Water is present in the atmosphere
Big Idea 2: Water can change from liquid to vapor and from vapor to liquid.
Big Idea 3: Trees are part of the water cycle

Vocabulary: atmosphere, water cycle, condensation, evaporation, water vapor, precipitation, temperature, humidity, roots, trunk, crown

Content Statements	Content Elaboration and Clarification from Model Curriculum	Strategies for Instruction and Assessment + Resource Options
2.ESS.2: Water is present in the atmosphere. Water is present in the atmosphere as water vapor. When water vapor in the atmosphere cools, it forms clouds, fog, rain, ice, snow, sleet or hail. **Note:** *The emphasis at this grade level is investigating condensation and evaporation, not memorizing the water cycle itself.* **Note:** *The emphasis is not*	**Prior Concepts Related to Water in the Atmosphere** **PreK-1:** The term energy is introduced in grade 1. Wind and water are observable parts of weather. Sunlight warms water and air. The physical properties of water can change (liquid to solid and solid to liquid). **Grade 2 Concepts** The physical properties of water (from grade 1) are expanded to include water vapor (water in the air). The different states of water are observed in weather events, nature and/or classroom investigations. The concepts of condensation and evaporation are explored through experimentation and observation. The different parts of the water cycle are explored and discussed. The focus is on investigation and understanding, not on vocabulary. Water can change from liquid to vapor and from vapor to liquid. When water in the atmosphere cools because of a change in energy, it often forms small droplets of liquid water or ice that can be seen as clouds. The small water droplets can then form raindrops. Water droplets can change to solid by freezing into snow, sleet or hail. Cloud formation and types of clouds are introduced as they relate to weather. Clouds are moved by wind. Factors such as water contamination/pollution can be introduced within this content statement as they relate to pollutants that can enter waterways through precipitation, evaporation and condensation. Experiments and investigations that demonstrate the conditions required for condensation or evaporation to occur lead to a deeper understanding of these concepts. Appropriate tools and technology can be used to observe, share results or document data. Relating the required conditions to actual weather observations, collecting and documenting data, drawing conclusions from the	Water Cycle Detectives: Lessons 4.1,4.1, 4.3, 4.4,5.1, 5.2, 5.3, 5.4, 6.1, 6.4 **Exit Ticket**: Draw and explain the water cycle. (Possible Seesaw Activity; The focus is not on memorization of the cycle but on understanding.)

in naming cloud types, but in relating the characteristics of the clouds with weather.	data and discussions about the findings are included for this content statement. **Future Application of Concepts** **Grades 3-5:** The states and conservation of matter, weathering and erosion of Earth's surface, seasonal changes and energy transfer are explored. **Grades 6-8:** The hydrologic cycle, transfer of energy among the atmosphere, hydrosphere and lithosphere and biogeochemical cycles are studied.	
2.ESS.3: Long- and short-term weather changes occur due to changes in energy. Changes in energy affect all aspects of weather, including temperature, precipitation, and wind.	**Prior Concepts Related to Water in the Atmosphere** **PreK-1:** The term energy is introduced in grade 1. Weather changes during the day and from day to day. Weather changes can be long- or short-term. Weather changes can be measured and have patterns. **Grade 2 Concepts** Weather is a result of energy change. Heating (from sunlight) and cooling of water, air and land are directly related to wind, evaporation, condensation, freezing, thawing and precipitation. Density and convection should not be introduced at this grade level. Weather patterns (long-term) and fronts (short term) can be documented through consistent measuring of temperature, air pressure, wind speed and direction, and precipitation. Some forms of severe weather can occur in specific regions/areas, scientists forecast severe weather events. Weather data can be measured, collected and documented over a period of time and then connected to observable forms of energy (e.g., wind causes a sailboat to move, the sun can heat the sidewalk). Experiments and investigations (both inside and outside of the classroom) are used to demonstrate the connection between weather and energy. Discussion of energy at this grade level should be limited to observable changes. **Future Application of Concepts** **Grades 3-5:** Changes in energy and changing states of matter are explored in greater depth through applications other than weather. Renewable resources (energy sources) and changes in Earth's environment through time are examined. **Grades 6-8:** Changes of state are explained by molecules in motion, kinetic and potential energy. The hydrologic cycle and thermal energy transfers among the hydrosphere, lithosphere, and atmosphere are studied.	Water Cycle Detectives: Lessons 4.4, 6.4 **Exit Ticket:** (from lesson 4.4 Steps 10-13) Students create a poster that shows all four kinds of precipitation and write the definition of precipitation.
2.LS.1: Living things cause changes on Earth. Living things function and interact with their physical environments. Living things cause changes in the environments where they	**Prior Concepts Related to Interactions within Environments** **PreK-1:** Macroscopic characteristics of living things are observed, including basic survival needs of living things, how living things get resources from the environment and how available resources vary throughout the course of a year. **Grade 2 Concepts** The environment is a combination of the interactions between living and non-living components. Living things can cause changes in their ecosystems, which can be observed. These interactions can cause changes in groups of living things and the physical environment (e.g., soil, rocks, water). Conducting investigations (in nature or virtually) to document specific changes in the	Water Cycle Detectives: Lessons 4.3, 5.2, 5.3, 5.4, 6.2, 6.3, 6.4

live; the changes can be very noticeable or slightly noticeable, fast or slow. **Note:** *At this grade level, discussion is limited to changes that can be easily observed.*	ecosystem, as well as the results of those changes, are used to demonstrate this concept (e.g., moles tunneling in a lawn, beavers or muskrats building dams, plants growing in cracks of rocks). Maps or charts can be used to document the location of specific types of living things found in the local area. The impact and actions of living things are investigated and explored. The focus is not limited to human interaction with the environment (such as resource use or recycling) and includes activities such as observing earthworm compost bins, ant farms and weeds growing on vacant lots. **Future Application of Concepts** **Grades 3-5:** Changes that occur in an ecosystem can sometimes be beneficial and sometimes harmful. **Grades 6-8:** Matter is transferred constantly from one organism to another and between organisms and their physical environment.	Assessed in Tree Unit and Ice Age Unit

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Unit 4: Forces and Motion

Essential Question: How can the motion of an object be changed?

Big Idea 1: Motion can increase, change direction, or stop, depending on the force applied (including friction).
Big Idea 2: The change in the motion of an object is related to the size of the force applied to it.
Big Idea 3: Some forces act without touching, such as using a magnet to move an object or objects falling to the ground.

Vocabulary: push, pull, force, motion, friction, mass, gravity, energy, static electricity

Content Statements	Content Elaboration and Clarification from Model Curriculum	Strategies for Instruction and Assessment + Resource Options
2.PS.1: Forces change the motion of an object. Motion can increase, change direction or stop depending on the force applied. The change in motion of an object is related to the size of the force. Some forces act without touching, such as using a magnet to move an object or objects falling to the ground.	**Prior Concepts Related to Forces and Motion** **PreK-1:** Vibrating objects are observed producing sound. Motion is described as a change in an object's position. Forces are pushes and pulls that can change the motion of objects. **Grade 2 Concepts** Forces are needed to change the movement of an object by speeding up, slowing down, stopping or changing direction. Some forces act when an object is in contact with another object (e.g., physically pushing or pulling). Other forces act when objects are not in contact with each other (e.g., magnetic, gravitational, electrical). Gravitational, static electrical and magnetic forces are introduced through observation and experimentation only. The definitions of these forces should not be the focus of instruction. Earth's gravity pulls any object toward it, without touching the object. Static electricity also can pull or push objects without touching the object. Magnets can pull some objects to them (attraction) or push objects away from them (repulsion). Gravity, static electricity and magnets can be explored through experimentation, testing and investigation at this grade level. For a particular object, larger forces cause larger changes in motion. A strong kick to a rock is able to cause more change in motion than a weak kick to the same rock. Real-world experiences and investigations are used for this concept. There often is confusion between the concepts of force and energy. Force can be thought of as a push or pull between two objects and energy as the property of an object that can cause change. A force acting on an object can sometimes result in a change in energy. The difference between force and energy will be developed over time	Forces and Motion Unit

	and is not appropriate at this grade level. **Note:** *Introducing fields, protons, electrons or mathematical manipulations of positive and negative to explain observed phenomena is not appropriate at this grade level.* **Future Application of Concepts** **Grades 3-5:** The amount of change in movement of an object depends on the mass of the object and the amount of force exerted. **Grades 6-8:** Speed is defined and calculated. The field concept for forces at a distance is introduced.	