Grade Two Science

Theme ***Observations of the Environment***

Strand Connection

Living and nonliving things may move. A moving object has energy. Air moving is wind, and wind can make a windmill turn. Changes in energy and movement can cause change to organisms and the environments in which they live.

Science Inquiry and Applications: *All students must be developing the ability to:*

- Observe and ask questions about the natural environment
- Plan and conduct simple investigations
- Employ simple equipment and tools to gather data and extend the senses
- Use appropriate mathematics with data to construct reasonable explanations
- Communicate about observations, investigations, and explanations
- Review and ask questions about the observations and explanations of others

Topic ***The Atmosphere***

This topic focuses on air and water as they relate to weather and weather changes that can be observed and measured.

Pacing

This unit will be ongoing as it is incorporated into the daily classroom routine of observing weather changes.

In addition to the daily weather observations, a focus of this unit should take place for 2-4 weeks.

Content Statement

1. The atmosphere is made up of air.

a. 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.

Note: Air is introduced in ESS Kindergarten and can be linked to PS and LS.

Learning Targets:

- I can use tools to measure wind speed and direction.
- I can recognize that air takes up space and can be weighed.
- I can describe wind related weather events (tornadoes, hurricanes).
- I can use technology to monitor changes in weather.

Content Elaborations

Prior Concepts Related to Air and Atmosphere

PreK-1: Wind is moving air, 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). In grade 2, wind can be measured with numeric value and direction (e.g., wind speed is 6 mph, wind direction is west to east).

Air takes up space (has volume) and has mass*. 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 must be 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. ***Future Application of Concepts*** Grades 3-5: Renewable energy, air pollution, and wind can weather and erode Earth's surface. Grades 6-8: Thermal energy transfers in the atmosphere, air currents, and global climate patterns. *While mass is the scientifically correct term to use in this context, the NAEP 2009 Science Framework (page 27) recommends using the more familiar term "weight" in the elementary grades with the distinction between mass and weight being introduced at the middle school level. In Ohio, students will not be assessed on the differences between mass and weight until Grade 6.
Content Vocabulary • atmosphere • hurricane • recognize • tornado • weight	**Academic Vocabulary** • affect • apply • compare • conclude • direction • evidence • hypothesize • investigate • modify • procedure • results • similarity

Formative Assessments	**Summative Assessments**
• Students will be assessed throughout the unit based on their classroom discussions and contributions to their individual science response journals.	Not applicable at this grade level.
Resources • Weather station – one per building (can use weather.com or weatherbug.com) • Anemometer • Analemma.com • Science journal • Weather books	**Enrichment Strategies** • Games • Graphic organizers • Websites • Individual research on specific topics
Integrations • **ELA**: Picture books and nonfiction texts. Students should also engage in writing activities throughout the unit, including predictions, observations, procedures, and conclusions. Students may also conduct individual research on specific topics. • **Math**: Measuring and graphing	**Intervention Strategies** • Games • Flashcards • Graphic organizers • Websites

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Topic ***The Atmosphere***

This topic focuses on air and water as they relate to weather and weather changes that can be observed and measured.

Pacing

This unit will be ongoing, as it is incorporated into the daily classroom routine of observing weather changes.

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Content Statement

2. Water is present in the air.

a. Water is present in the air as clouds, steam, fog, rain, ice, snow, sleet, or hail. When water in the air cools (change of energy), it forms small droplets of water than can be seen as clouds. Water can change from liquid to vapor in the air and from vapor to liquid. The water droplets can form into raindrops. Water droplets can change to solid by freezing into snow, sleet, or hail. Clouds are moved by flowing air.

Note: This concept builds upon the changing properties of water from ESS Grade 1.

Learning Targets:

- I can identify the different ways water is present in the air (clouds, steam, fog, rain, ice, snow, sleet, hail).
- I can recall that water changes from liquid to vapor and/or vapor to liquid in the air.

Content Elaborations

Prior Concepts Regarding Relationship of Water and Air

PreK-1: Wind and water are observable parts of weather, sunlight warms water and air, and 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 emphasis at this grade level is investigating condensation and evaporation at depth, not memorizing the water cycle itself.

• I can observe clouds and describe their characteristics and how they relate to weather (introduce cloud types not assessed, storm fronts, changing weather).	The focus is on investigation and understanding, not on the vocabulary. Cloud formation and types of clouds are introduced as they relate to weather, storm fronts, and changing weather. Again, the emphasis is not in naming cloud types but in relating the characteristics of the clouds with weather. Factors such as water contamination/pollution can be introduced within this content statement as it relates 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 (to observe, share results, or to document data) are required. Relating the required conditions to actual observations (outside the classroom), collecting and documenting data, drawing conclusions from the data, and discussion about the findings must be 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 between the hydrosphere and lithosphere, and biogeochemical cycles are studied.
Content Vocabulary • condensation • contamination • evaporation • pollution • precipitation • water vapor	**Academic Vocabulary** • affect • apply • compare • conclude • direction • evidence • hypothesize • investigate • modify • procedure • results • similarity

Formative Assessments • Use the student responses from the weather journals to determine student understanding/knowledge.	**Summative Assessments** Not applicable at this grade level.
Resources • Science journal • Cloud in a jar/bottle-find online • Weather books • Earth Science inquiry lesson materials: ~ clear cups ~ water ~ permanent marker ~ items to seal/cover the tops of the cup (Saran wrap, cardboard, paper) ~ items to add to water (baking soda, salt, food coloring)	**Enrichment Strategies** • Games • Graphic organizers • Websites
Integrations • **ELA**: Picture books and nonfiction texts. Students should also engage in writing activities throughout the unit, including predictions, observations, procedures, and conclusions. • **Math**: Measuring and graphing.	**Intervention Strategies** • Games • Flashcards • Graphic organizers • Websites

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Science Inquiry and Applications: *All students must be developing the ability to:*

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Topic ***The Atmosphere***

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Pacing

This unit will be ongoing, as it is incorporated into the daily classroom routine of observing weather changes.

Content Statement

3. Long- and short-term weather changes occur due to changes in energy.

a. Changes in energy affect all aspects of weather, including temperature, precipitation amount, and wind.

Note: Discussion of energy at this grade level should be limited to observable changes.

Learning Targets:

- I can represent changes in weather with a daily log of weather measurements (temperature, air pressure, wind speed, direction, and precipitation).

Content Elaborations

Prior Concepts Related to Weather Changes

PreK-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 changes. Heating and cooling of water, air, and land (from sunlight) are directly related to wind, evaporation, condensation, freezing, thawing, and precipitation. Weather patterns (long-term) and fronts (short-term) can be documented through consistent measuring of temperature, air pressure, wind speed and direction, and precipitation.

Weather data must 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) must be used to demonstrate the connection between weather and energy.

	Note: Density and convection should not be introduced at this grade level. ***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 and kinetic and potential energy. The hydrologic cycle and thermal energy transfers between the hydrosphere and atmosphere are studied.
Content Vocabulary • air pressure • direction • energy • precipitation • temperature	**Academic Vocabulary** • affect • apply • compare • conclude • direction • evidence • hypothesize • investigate • modify • procedure • results • similarity
Formative Assessments • Use the student responses from the weather journals to determine student understanding/knowledge.	**Summative Assessments** Not applicable at this grade level.
Resources • Weather calendar/journal • Weather station – one per building (can use weather.com or weatherbug.com) • Thermometer • Weather vane • Weather books	**Enrichment Strategies** • Games • Graphic organizers • Websites

Integrations	Intervention Strategies
• **ELA**: Picture books and nonfiction texts. Students should also engage in writing activities throughout the unit, including predictions, observations, procedures, and conclusions. • **Math**: Measuring and graphing.	• Games • Flashcards • Graphic organizers • Websites

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Topic ***Interactions Within Habitats***

This topic focuses on how ecosystems work by observations of simple interactions between the biotic/living and abiotic/nonliving parts of an ecosystem. Just as living things impact the environment in which they live, the environment impacts living things.

Pacing

A focus of this unit should be conducted over 7-10 days.

Content Statement

4. Living things cause changes on Earth.

a. 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.

Learning Targets:

- I can describe how living things cause changes in their nonliving environment.
- I can record my observations of changes caused by living things.

Content Elaborations

Prior Concepts Related to Interactions Within Habitats

PreK-1: Observe macroscopic characteristics of living things including basic survival needs of livings 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 nonliving components. Living things can cause changes in their environment which can be observed. These interactions can cause changes in groups of living things and the physical environment. Conducting investigations (in nature or virtually) to document specific changes and the results of the changes must be 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 (digital or 2-D) 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 must be investigated and explored. The focus is not limited to human interaction with the environment. Observe earthworm compost bins, ant farms, and weeds growing on vacant lots. ***Future Application of Concepts*** Grades 3-5: Changes that occur in an environment can sometimes be beneficial and sometimes harmful. Grades 6-8: Matter is transferred continuously from one organism to another and between organisms and their physical environment.
Content Vocabulary • environment • habitat	**Academic Vocabulary** • affect • apply • compare • conclude • direction • evidence • hypothesize • investigate • modify • procedure • results • similarity
Formative Assessments • Use the student responses from their observation journals, classroom discussions, and teacher observations to determine student understanding/knowledge.	**Summative Assessments** Not applicable at this grade level.
Resources • Life Science inquiry lesson materials include: ~ response journal ~ ant farm ~ ants • Animal/plant books (include books on animals that cause change to their environment; i.e., beavers, worms, ants)	**Enrichment Strategies** • Games • Graphic organizers • Websites • Individual research on specific topics

Integrations	Intervention Strategies
• **ELA**: Picture books and nonfiction texts. Students should also engage in writing activities throughout the unit, including predictions, observations, procedures, and conclusions. Students may also conduct individual research on specific topics.	• Games • Flashcards • Graphic organizers • Websites

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Pacing

A focus of this unit should be conducted over 5-7 days.

Content Statement

5. Some kinds of individuals that once lived on Earth have completely disappeared, although they were something like others that are alive today.

a. Living things that once lived on Earth no longer exist; their basic needs were no longer met.

Learning Targets:

- I can identify living things that are now extinct.
- I can explain why living things become extinct.
- I can identify similarities among living things and those that are extinct.

Content Elaborations

Prior Concepts Related to Interactions Within Habitats

PreK-1: Living things have physical traits which enable them to live in different environments.

Grade 2 Concepts

Fossils are physical traces of living things that are preserved in rock. By examining fossils, it can be determined that 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 member of a living thing's kind. Sometimes extinction is described as the dying out of all members of the living thing's kind. Extinction generally occurs as a result of changed conditions to which the living thing's kind is not suited. Some kinds of living things that once lived on Earth have completely disappeared (e.g., the Sabertooth Cat,

	Smilodon). Some kinds of living things that once lived on Earth are something like others that are alive today (e.g., horses). Explore and compare a vast array of organisms, both extinct (e.g., Rugosa Coral, Sphenopsids) and extant (e.g., Brain Coral, Equisetum). Research and exposure should focus on the organism and its environment for both extinct and extant organisms. Photographs, video, websites, books, local parks, and museums can be used to visualize past environments and the organisms that lived in them. ***Future Application of Concepts*** Grades 3-5: Fossils will be addressed in more detail. Grades 6-8: This concept will be expanded to provide a partial explanation of biodiversity.
Content Vocabulary • extinction • fossil • needs	**Academic Vocabulary** • affect • apply • compare • conclude • direction • evidence • hypothesize • investigate • modify • procedure • results • similarity
Formative Assessments • Use the student responses from classroom discussions and teacher observations to determine student understanding/knowledge.	**Summative Assessments** Not applicable at this grade level.
Resources • www.dnr.state.oh.us • Fossil samples • Extinction/endangered related books: ~ *Will We Miss Them?*, by Alexandra Wright	**Enrichment Strategies** • Games • Graphic organizers • Websites • Individual research on specific topics

~ *It's My World Too*, by Elena Pasquali ~ *Can We Save Them?*, by David Dobson ~ *Gone Forever—An Alphabet of Extinct Animals*, by Sandra Markle ~ *What Happened to the Dinosaurs? A Book About Extinction*, by Rebecca Olien	
Integrations • **ELA**: Picture books and nonfiction texts. Students should also engage in writing activities throughout the unit, including predictions, observations, procedures, and conclusions. Students may also conduct individual research on specific topics.	**Intervention Strategies** • Games • Flashcards • Graphic organizers • Websites

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Topic ***Changes in Motion***

This topic focuses on observing the relationship between forces and motion.

Pacing

A focus of this unit should be conducted over 5-7 days.

Content Statement

6. Forces change the motion of an object.

a. Motion can increase, change direction, or stop depending on the force applied.
b. The change in motion of an object is related to the size of the force.
c. Some forces act without touching, such as using a magnet to move an object or objects falling to the ground.

Note: At this grade level, gravitational and magnetic forces should be introduced through observation and experimentation only. The definitions of these forces should not be the focus of the content statements.

Learning Targets:

- I can recognize that force changes the motion of an object.
- I can observe a noncontact force that can change the motion of an object.
- I can observe a contact force that can change the motion of an object.
- I can demonstrate that bigger changes in motion are caused by larger forces.

Content Elaborations

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 (speed up, slow down, change direction, or stop) of an object. Some forces may act when an object is in contact with another object (e.g., pushing or pulling). Other forces may act when objects are not in contact with each other (e.g., magnetic or gravitational).

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 must be explored through experimentation, testing, and investigation at this grade level.

	For a particular object, larger forces can 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 must be used for this concept. Note 1: Introducing fields, protons, electrons, or mathematical manipulations of positive and negative to explain observed phenomena are not appropriate at this grade level. Note 2: 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 differences between force and energy will be developed over time and are not appropriate at this grade level. Note 3: Charges and poles are often confused. It is important to emphasize that they are different. ***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. *While mass is the scientifically correct term to use in this context, the NAEP 2009 Science Framework (page 27) recommends using the more familiar term "weight" in the elementary grades with the distinction between mass and weight being introduced at the middle school level. In Ohio, students will not be assessed on the differences between mass and weight until Grade 6.
Content Vocabulary • contact • force • gravity • magnetic • motion • noncontact	**Academic Vocabulary** • affect • apply • compare • conclude • direction • evidence

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- pull
- push

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- hypothesize
- investigate
- modify
- procedure
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- similarity

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Formative Assessments

- Use the student responses from their observation journals, classroom discussions, and teacher observations during activities to determine student understanding/knowledge.

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Summative Assessments

Not applicable at this grade level.

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Resources

- Forces and motion books:
  - ~ *Forces Make Things Move*, by Kimberly Brubaker Bradley
  - ~ *Gravity is a Mystery*, by Franklin Branley
  - ~ *Motion: Push and Pull, Fast and Slow*, by Darlene Stille
  - ~ *Move It!: Motion, Forces and You*, by Adrienne Mason
- Physical Science inquiry lesson materials:
  - ~ response journal
  - ~ steel balls
  - ~ magnets of different sizes (Sizzlers work well)
  - ~ white boards (to be used as ramps)
  - ~ dry erase markers
  - ~ tape
  - ~ materials to elevate the ramp (i.e., books, etc.)

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Enrichment Strategies

- Games
- Graphic organizers
- Websites

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Integrations

- **ELA**: Picture books and nonfiction texts. Students should also engage in writing activities throughout the unit, including predictions, observations, procedures, and conclusions.
- **Math**: Measuring and graphing.

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Intervention Strategies

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