Course: BES Science Grade 1

Unit 1: Air and Weather

Grade Level(s): First grade	**Length of Unit:** 32 lessons / days (Investigation 2/Part 1 and Investigation 4/Part 1 should be introduced in September as part of Morning Meeting)

Unit Rationale:

In this module, young students turn their focus to the sky to make observations that will heighten their awareness, curiosity, and understanding of Earth's dynamic atmosphere and the observable patterns of objects in the sky. Students explore the natural world by using simple instruments and calendars to observe and monitor change.

Students build on the science concepts of weather and how the Sun warms Earth's surface, introduced in kindergarten. They use new tools and methods to enrich observations. Students find out about properties of air by exploring how objects interact with air. Students observe daily changes in air temperature and connect them to the daily movement of the Sun in the sky. They monitor changes in hours of daylight over the seasons and connect them to changing weather conditions. And they find the Moon in the day and night skies and monitor its movement over the month.

Throughout the Air and Weather Module, students engage in science and engineering practices by collecting data and designing and using tools to answer questions. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; structure and function; and stability and change.

Stage 1 - Desired Results

Enduring Understandings:

Students will understand that…

- Air is matter and is all around us.
- Weather describes conditions in the air outside; these conditions can be measured.
- Wind is moving air.
- Daily changes in temperature and weather type can be observed, compared, and predicted.
- Each season has typical weather conditions that can be compared and predicted.
- Climate change can affect weather patterns
- Weather affects animals and plants.
- The Sun and Moon can be observed moving across the sky; Changes in shape and location are regular and predictable.
- Each season has a typical weather pattern that can be observed, compared, and predicted.
- The hours of daylight change with the seasons.

Essential Questions:

- What can air do?
- What is the weather today?
- How can we use tools to observe and tell us about the wind?
- How can we describe the weather over a month?
- How does the weather and temperature change over the seasons?
- How does the position of the sun, moon, & stars change over time?
- Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change)

Content:

Students will know…

- Air is a gas and takes up space.

Skills:

Students will be able to…

- Explore properties of air using vials, syringes and tubing

- Air makes objects move.
- Air moves from place to place. Moving air is wind.
- Air resistance affects how things move.
- Air can be compressed.
- The pressure from compressed air can move things, including water.
- Weather describes conditions in the air outside.
- Weather conditions can be measured using tools such as thermometers, wind vanes, anemometers, and rain gauges.
- Temperature describes how hot or cold the air is. Temperature is measured with a thermometer.
- Clouds are made of liquid water drops that fall to Earth as rain. Wind moves clouds in the sky.
- The Sun heats Earth during the day.
- The Sun and Moon move across the sky in a specific pattern; we see them at different locations in the sky, depending on the time of day or night.
- The number of hours of daylight changes predictably through the seasons.
- The Sun can be seen only in the daytime, while the moon can be seen both in the daytime and nighttime.
- There are more stars in the sky than anyone can easily see or count.
- Wind is moving air.
- Meteorologists use wind scales (models) to describe the strength of the wind.
- Meteorologists use anemometers to measure the speed of the wind.
- A wind vane points in the direction the wind is coming from.

- Construct and compare parachutes and balloon rockets
- Use instruments to observe and record weather
- Identify three basic cloud types
- Monitor temperature with a thermometer
- Monitor times of sunrise and sunset in order to record the number of daylight hours each day
- Observe and describe wind speed using pinwheels, anemometer, and wind scale
- Observe bubbles and construct wind vanes to find wind direction
- Use kites to feel strength of wind and direction of movement
- Organize monthly weather data
- Use graphs to describe weather trends
- Look for monthly patterns of the Moon and annual patterns of daylight hours
- Design a tool or that could help the planet with climate change

Performance Expectations ("the Standards"):

• 1-ESS1-1 Use observations of the sun, moon, and stars to describe patterns that can be predicted

• 1-ESS1-2 Make observations at different times of year to relate the amount of daylight to the time of year

Investigation 1,2,4

Connected Components:

Science and Engineering Practices:

Planning and Carrying out Investigations:

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)

Analyzing and Interpreting Data:

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1- ESS1-1)

Disciplinary Core Ideas:

ESS1.A: The Universe and its Stars

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)

ESS1.B: Earth and the Solar System

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)

Crosscutting Concepts:

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1), (1-ESS1-2)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes natural events happen today as they happened in the past. (1-ESS1-1)
- Many events are repeated. (1- ESS1-1)

Career Education (Career Readiness, Life Literacies, and Key Skills Practices and 9.2 Standards)

9.1.2.CAP.1: Make a list of different types of jobs and describe the skills associated with each job.

CLKS Practices:

1. Consider the environmental, social and economic impacts of decisions
2. Utilize critical thinking to make sense of problems and persevere in solving them

Connected Careers:

astronaut, astronomer, meteorologist

Explanation of how 9.2 standards connect to the unit:

Understanding how different types of weather are formed, weather's positive and negative effects on us, and the cause and results of seasonal changes are important skills needed for various careers, such as meteorologist, astronaut/astronomer, and environmental scientist.

Explanation of how CLKSs connect to the unit:

Consider the environmental, social, and economic impacts of decisions: Economic decisions can have a broad and critical impact on our environment and weather conditions. Understanding the many ways our environment can be affected by human interactions can help to prevent detrimental outcomes. For example, global warming directly results from human activity, resulting in negative changes to our climate.

Utilize critical thinking to make sense of problems and persevere in solving them: By studying the seasonal patterns of sunrise and sunset and how they relate to the rotational pattern of the Earth around the sun, students will determine the related seasonal conditions and how people adapt to them.

Explanation of how Connected Careers connect to the unit:
Meteorologist/Environmental Scientist: Students study how the water cycle is the basis for all weather and they learn to identify 3 basic cloud formations and the kind of weather that they predict. They also learn how moving air, or wind, impacts weather.
Astronomer/Astronaut: This unit explores the predictive patterns of the sun, moon and stars in the sky, which is a fundamental understanding for careers as an astronomer, astronaut, or aerospace engineer.

Interdisciplinary Standards

Math Connections:

- **1.OA.A.1 -** Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.
- **1.DL.A.1** - Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Literacy Connections:

- **W.WR.1.5** -With prompting and support, generate questions through shared research about a topic and determine possible sources to obtain information on that topic.
- **W.IW.1.2** - With prompts and support, write informative/explanatory texts to examine a topic and convey ideas and information.
    A. Introduce topic
    B. Develop the topic with facts or other information and examples related to the topic.
    C. Provide a conclusion
- **RI.CR.1.1** Ask and answer questions about key details in an informational text.(e.g., what, where, when, why. how)
- **RI.TS.1.4** - With prompting and support, explain major differences between books that tell stories and books that give information, identifying various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text, while drawing on a wide reading of a range of text types.

Explanation of how interdisciplinary standards connect to the unit:
Math Connections:

- **1.OA.A.1:** Students will use the operational skills of addition and subtraction to determine and chart changes in sunrise and sunset times over a given period of days.
- **1.DL.A.1**: The temporal changes of sunrise and sunset over a given period of days will be recorded on a line graph so that students can determine the patterns of change.

Literacy Connections:

- **W.WR.1.5:** During the unit, students will have opportunities to ask wonder questions generated from the information presented. When possible, students may brainstorm the possible resources that may be used to answer their questions. For example, if a student were interested in determining the time of sunrise without daily monitoring, an online weather report could be examined.
- **W.IW.1.2**: Most science lessons end with a student or class-generated journal entry that reviews the information learned in that activity or lesson.
- **RI.CR.1.1**:Science lesson discussions always include opportunities for students to ask questions about concepts taught in related non-fiction texts and brainstorm possible answers.
- **RI.TS.1.4:** During the many read-aloud books used during this unit, students will determine if they are fiction or

nonfiction, explore the various non-fiction text features used, as well as determine the different ways they present information.

Technology Integration (9.4 Standards):

9.4.2.CT.1: Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).

9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive).

9.4.2.IML.3: Use a variety of sources including multimedia sources to find information about topics such as climate change, with guidance and support from adults (e.g., 6.3.2.GeoGI.2, 6.1.2.HistorySE.3, W.2.6, 1-LSI-2).

Explanation of how 9.4 standards connect to the unit:
During the study of the sun as a source of light and heat, as well as studying changes in temperature through the seasons, students will also explore the issue of climate change through books and online videos. On a primary level, students will review ways that climate change is harmful and brainstorm ways to curtail the negative effects of the sun and the deteriorating atmosphere.

Stage 2- Assessment Evidence:	
Assessment:	
Formative	**Teacher observation** - occurs daily and provides continuous monitoring of students' learning **Student participation**- observation of students' actions and engagement **Lab experiments:** Use science journals to check student understanding of entries. **Focus Questions:** Students summarize their learning at the end of each lab experiment. **Response Sheet:** Students provide content to answer a provided question. Evidence for answer is required. **Science Journal Check:** Students record data in their science journals that describe the results during each lab. Journals are collected and assessed. **Science Notes:** Throughout the unit, students fill in content provided in the notes to act as the student textbook. Students may use prepared *notebook sheets* or may generate *free-form notebook entries* that could both be collected and assessed for student progress.
Summative	**Check Performance Assessments:** These are teacher-prepared formal assessments that are appropriate for the students. They are up to one period in length and are taken individually. They are given at the end of the Investigation. This is a performance-based assessment. **Survey/Post-test:** A full-period assessment that consists of content questions, multiple choice, fill-in-the-blank, and open-response questions.
Alternative	**Tutorials/Virtual Investigations:** Virtual simulations are provided for each investigation to enrich lab experiences. **Response Sheet:** Students provide content to answer a provided question.

Benchmark	***I-Checks*** (benchmark assessments)
Other (optional)	

Stage 3 - Learning Plan

Learning Activities:

- Investigation 1: Observing Air
- Investigation 2: Exploring the Sky
- Investigation 3: Wind Explorations
- Investigation 4: Looking for Change

Related Application/Connection/Extension problems (Inv 1)

- **Investigation 1, Part 1:** Air Is There
- **Investigation 1, Part 2:** Parachutes
- **Investigation 1, Part 3:** Pushing on Air
- **Investigation 1, Part 4:** Air and Water
- **Investigation 1, Part 5:** Balloon Rockets

Related Application/Connection/Extension problems (Inv 2)

- **Investigation 2, Part 1:** Weather Calendars
- **Investigation 2, Part 2:** Measuring Temperature and Daylight
- **Investigation 2, Part 3:** Watching Clouds
- **Investigation 2, Part 4:** Observing the Moon

Related Application/Connection/Extension problems (Inv 3)

- **Investigation 3, Part 1:** Bubbles in the Wind
- **Investigation 3, Part 2:** Wind Speed
- **Investigation 3, Part 3:** Pinwheels
- **Investigation 3, Part 4:** Wind Vanes
- **Investigation 3, Part 5:** Kites

Related Application/Connection/Extension problems (Inv 4)

- **Investigation 4, Part 1:** Changes Over a Month

Differentiation:

ELL:
- More experience building explanations of science concepts orally or in writing or drawing
- Making vocabulary more explicit through new concrete experiences or reading passages
- More opportunities for experiencing science outside the classroom in more natural, outdoor environments

G&T:
- Designing individual projects or small-group investigations

Special Ed:
- More time with active investigations or online activities
- Scaffolding their thinking through graphic organizers
- More opportunities for experiencing science outside the classroom in more natural, outdoor environments

504:
- Scaffolding their thinking through graphic organizers
- More opportunities for experiencing science outside the classroom in more natural, outdoor environments

Students at Risk:
- Scaffolding their thinking through graphic organizers
- More opportunities for experiencing science outside the classroom in more natural, outdoor environments

Link to Science Differentiation Chart and Accommodations Chart

Investigation 4, Part 2: Daylight through the Year **Investigation 4, Part 3:** Comparing Seasons	

Core and Supplementary Instructional Materials

Teacher Pedagogical Resources:
List here.

- FOSS Air and Weather teacher manual
- FOSS Air and Weather teacher toolkit and equipment kit
- FOSS Science Resource books
- FOSS technology website: www.FOSSweb.com
- Read-alouds:The Moon Book (Gail Gibbons)/ MoonBear (Frank Asch)
  Cloudy with a Chance of Meatballs(Judi Barrett)/The Cloud Book (Tomei DiPaola)
  What is Climate Change? (Gail Herman)
  The Earth Book (Todd Parr)
- Bedwell Garden (weather station)

Student Materials:

- FOSS student textbook
- FOSS Science Resource books
- FOSS equipment kit
- Bedwell Garden (weather station)

Notes:
Inclusion of Climate Change Opportunities

During the study of the sun as a source of light and heat, as well as studying changes in temperature through the seasons, students will also explore the issue of climate change through books and online videos. On a primary level, students will review ways that climate change is harmful (Earth is hotter and drier which affects growth of plants and the well-being of organisms) and brainstorm ways to curtail the negative effects of the sun and the deteriorating atmosphere (create less pollution, plant more trees).·

Students will discuss possible solutions to local and global problems caused by severe weather with peers and adults.

Air and Weather Pacing Guide

Time Period	**Observing the Moon Investigation 2 can be done January, February or March**	**Investigation 4, Part 1:** Changes Over a Month **Investigation 4, Part 2:** Daylight through the Year	**Investigation 4, Part 3:** Comparing Seasons **To be done over the year during calendar/ MM**	

March	**Investigation 1:** Observing Air **Part 1:** Air is There	**Investigation 1,** Observing Air **Part 2:** Parachutes	**Investigation 1,** Air is There **Part 3,4:** Pushing on Air/ Air and Water	**Investigation 1,** Air is There **Part 5:** Balloon Rockets
March	**Investigation 2:** Exploring the Sky **Part 1:** Weather Calendars	**Investigation 2:** Exploring the Sky **Part 2:** Measuring Temperature and Daylight	**Investigation 2:** Exploring the Sky **Part 3:** Watching Clouds	**Investigation 2:** Exploring the Sky **Part 4: See Above**
March	**Investigation 3, Part 1:** Bubbles in the Wind	**Investigation 3, Part 2,3:** Wind Speed/Pinwheels	**Investigation 3, Part 4:** Wind Vanes	**Investigation 3, Part 5:** Kites

Course: Science Grade 1	
Unit 2: Sound and Light	
Grade Level(s): First Grade	**Length of Unit: 13 days**

Unit Rationale:
This module provides experiences that help students develop an understanding of how to observe and manipulate sound and light. They explore these dimensions of the natural world using simple tools and musical instruments.

Students learn that sound comes from vibrating objects. They explore how to change sound volume and pitch, and develop simple models for how sound travels from a source to a receiver. With light, students also work with sources and receivers. They find out what happens when materials with different properties are placed in a beam of light, and explore how to create and change shadows and reflections. Students explore how to use sound and light devices to communicate information and compare the ways that animals use their senses (ears and eyes) to gather information about their environment.

Throughout the Sound and Light Module, students engage in science and engineering practices by collecting data and designing and using tools to solve problems and answer questions. Students gain experiences that contribute to their understanding of the crosscutting concepts: patterns; cause and effect; and systems and system models.

Stage 1 - Desired Results

Enduring Understandings:	**Essential Questions:**
Students will understand that… ● Sound can make matter vibrate, and vibrating matter can make sound.	● What causes sound? ● What information can sound give us? ● How does sound travel from source to receiver? ● What makes a shadow?

● People use a variety of devices to communicate (send and receive information) over long distances. ● Animals have body parts that capture and convey different kinds of information needed for growth and survival. ● Some materials allow light to pass through, others allow only some light through, and others block all the light and create a dark shadow on any surface beyond them. ● Mirrors can be used to redirect a light beam. ● Objects can be seen only when light is available to illuminate them. Some objects give off their own light.	● How can shadows be changed? ● How can sound and light be used to communicate?
Content: *Students will know…* ● Vibration is a rapid back-and-forth motion. ● Vibrating objects make sound; sound always comes from a vibrating object. ● Objects stop making sound when they stop vibrating. ● Sound can make objects vibrate. ● Sounds can convey information. ● Ears are one kind of sound receiver. ● Sound sources can be natural or human-made. ● Words can describe the sounds objects make. ● Volume is how loud or soft a sound is. ● A system is made of parts that work together. ● Sound vibrations travel through objects and the air. ● Drawings can show how sound travels from a source to the receiver. ● Vibrating objects make sound; sound always comes from a vibrating object. ● Engineers design communication devices. ● Light sources are objects or systems that give off light (radiate) ● Shadows are the dark areas that result when light is blocked. ● The size, length and direction of a shadow depends on the position of the light source. ● Light travels away from a source in all directions. ● Materials that are opaque block light. ● Materials that are transparent allow light to pass through them. ● Materials that are translucent allow some light to pass through them. ● A mirror can be used to redirect light. ● Light travels in straight lines. ● An image produced by something that reflects, such as a mirror, is always reversed.	**Skills:** *Students will be able to…* ● Explore the production of sound using various materials. ● Observe vibrations at the sound source and describe different sounds created. ● Discriminate between different kinds of sounds and determine what information sounds convey. ● Explore sounds that different animals make. ● Create a device to both send and receive sound. ● Create and change shadows by blocking light. ● investigate how light interacts with objects that are transparent, translucent, and opaque. ● Investigate how to use mirrors to direct light to different locations. ● Observe that objects can only be seen when light is available.

● Light is necessary for animals to see. Animal eyes receive light from objects and transfer the light to the brain to interpret as vision. Animal eyes are not all the same. There are different sizes, shapes, and placements on the head. ● Light can be used to communicate over long distances	

Performance Expectations ("the Standards"):

• 1-PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
• 1-PS4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated.
• 1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.
• 1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

Connected Components:

Science and Engineering Practices:

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question. (1-PS4-1), (1- PS4-3)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-PS4-2)
- Use tools and materials provided to design a device that solves a specific problem. (1-PS4-4)

Disciplinary Core Ideas:

PS4.A: Wave Properties

- Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1)

PS4.B: Electromagnetic Radiation

- Objects can be seen if light is available to illuminate them or if they give off their own light. (1- PS4-2)
- Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (1-PS4-3)

PS4.C: Information Technologies and Instrumentation

- People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4)

Crosscutting Concepts:

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-1), (1-PS4-2), (1-PS4-3)

Connections to Engineering, Technology, and Applications of Science Influence of Engineering, Technology, and Science, on Society and the Natural World

- People depend on various technologies in their lives; human life would be very different without technology. (1-PS4-4)

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

- Science investigations begin with a question. (1-PS4-1) Scientists use different ways to study the world. (1-PS4-1)

Career Education (Career Readiness, Life Literacies, and Key Skills Practices and 9.2 Standards)

9.2.2.CAP.1: Make a list of different types of jobs and describe the skills associated with each job.

CLKS Practices:

1. Demonstrate creativity and innovation.
2. Utilize critical thinking to make sense of problems and persevere in solving them

Connected Careers:

Audiologist, optometrist

Explanation of how 9.2 standards connect to the unit:
The study of sound provides foundational information for a variety of careers such as audiology, sound design engineering, or speech pathology as it requires an understanding of how sound is created and transmitted to the ear. Similarly, the study of light will allow students to explore careers in optometry or lighting design by learning how light is critical for vision and how light can be manipulated to create different images.

Explanation of how CLKSs connect to the unit:
Demonstrate creativity and innovation: Given a cup, book, and rubber band, students will make a variety of sounds and determine what is happening to produce that sound

Utilize critical thinking to make sense of problems and persevere in solving them: Using a mirror, students will determine how to see things behind them and then determine how these images are different than a direct image. They will also explore how to see things around a corner using a mirror.

Explanation of how Connected Careers connect to the unit:
The study of sound provides foundational information for a variety of careers such as audiology, sound design engineering, or speech pathology as it requires an understanding of how sound is created and transmitted to the ear. Similarly, the study of light will allow students to explore careers in optometry or lighting design by learning how light is critical for vision and how light can be manipulated to create different images.

Interdisciplinary Standards

Connections to NJSLS – English Language Arts

- **W.WR.1.5** -With prompting and support, generate questions through shared research about a topic and determine possible sources to obtain information on that topic.
- **W.IW.1.2** - With prompts and support, write informative/explanatory texts to examine a topic and convey ideas and information.
    D. Introduce topic
    E. Develop the topic with facts or other information and examples related to the topic.
    F. Provide a conclusion)
- **SL.1.1** Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. (1-PS4-1), (1-PS4-2), (1-PS4-3)

Connections to NJSLS – Mathematics

- **MP.5.** Use appropriate tools strategically. (1-PS4-4)
- **1.M.A.2** Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. (1-PS4-4)

Explanation of how interdisciplinary standards connect to the unit:

- **W.WR.1.5:** During the unit, students will have opportunities to ask wonder questions generated from the information presented. When possible, students may brainstorm the possible resources that may be used to answer their questions.
- **W.IW.1.2**: Most science lessons end with a student or class-generated journal entry that reviews the information learned in that activity or lesson.
- **SL.1.1:** Students work in cooperative groups and partnerships to determine how to set up the experiment and then review and analyze the outcomes. For example, students are challenged to create a sound using cup, rubber band and book. They must then determine what is occurring to produce that sound.
- **MP.5 /1.M.A.2:** When studying shadows, students will use a ruler to measure the length of a stick's shadow created by the sun across the day to see how this measurement changes over time.

Technology Integration (9.4 Standards):

9.4.2.CI.2: Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a
9.4.2.CT.2: Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
9.4.2.CT.3: Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
9.4.2.IML.2: Represent data in a visual format to tell a story about the data (e.g., 2.MD.D.10).

Explanation of how 9.4 standards connect to the unit:

During this unit, students have numerous opportunities to work in collaborative groups and partnerships to plan, execute and improve upon solutions to problems such as:

- How can sound be transmitted across a distance?
- How can we see things that are behind us (using a mirror)?

Stage 2- Assessment Evidence:	
Assessment:	
Formative	**Lab experiments:** Use science journals to check student understanding of entries. **Focus Questions:** Students summarize their learning at the end of each lab experiment. **Response Sheet:** Students provide content to answer a provided question. Evidence for answer is required. **Science Journal Check:** Students record data in their science journals that describes the results during each lab. Journals are collected and assessed. **Science Notes:** Throughout the unit, student full content is provided in the notes to act as the student textbook. Students may use prepared *notebook sheets* or may generate *free-form notebook entries* that could both be collected and assessed for student progress. **Teacher observation**: occurs on a daily basis and provides continuous monitoring of students' learning **Student participation**: observation of students' actions and engagement
Summative	**I-Check Performance Assessments:** These are teacher-prepared formal assessments that are appropriate for the students. They are up to one period in length and are taken individually. They are given at the end of the Investigation. This is a performance-based assessment. **Survey/Posttest:** A full-period assessment that consists of content questions, multiple choice, fill-in-the-blank, and open-response questions.
Alternative	**Response Sheet:** Students provide content to answer a provided question. Evidence for answer is required **Response Sheet:** Students provide content to answer a provided question. Evidence for answer is required.
Benchmark	***I-Checks*** (benchmark assessments)
Other (optional)	

Stage 3 - Learning Plan	
Learning Activities: **- Investigation 1:** Sound and Vibrations **- Investigation 2:** Changing Sound **- Investigation 3:** Light and Shadow	**Differentiation:** **ELL:** ● More experience building explanations of the

- Investigation 4: Light and Mirrors

Related Application/Connection/Extension problems (Inv 1)

Investigation 1, Part 1: Making Sounds
Investigation 1, Part 2: Hearing Sounds
Investigation 1, Part 3: Outdoor Sounds

Related Application/Connection/Extension problems (Inv 2)

Investigation 2, Part 1: Changing Volume
Investigation 2, Part 2: Changing Pitch (optional)
Investigation 2, Part 3: Spoon-Gong Systems
Investigation 2, Part 4: Sound Challenges

Related Application/Connection/Extension problems (Inv 3)

- **Investigation 3, Part 1:** Making Shadows
- **Investigation 3, Part 2:** Sun and Shadows
- **Investigation 3, Part 3:** Light and Materials

Related Application/Connection/Extension problems (Inv 4)

- **Investigation 4, Part 1:** Mirrors and Light Beams
- **Investigation 4, Part 2:** Reflections
- **Investigation 4, Part 3:** Eyes and Seeing
- **Investigation 4, Part 4:** Designing with Light

science concepts orally or in writing or drawing
- Making vocabulary more explicit through new concrete experiences or reading passages
- More opportunities for experiencing science outside the classroom in more natural, outdoor environments

G&T:
- Designing individual projects or small-group investigations

Special Ed:
- More time with active investigations or online activities
- Scaffolding their thinking through graphic organizers
- More opportunities for experiencing science outside the classroom in more natural, outdoor environments

504:
- Scaffolding their thinking through graphic organizers
- More opportunities for experiencing science outside the classroom in more natural, outdoor environments

Students at Risk:
- Scaffolding their thinking through graphic organizers
- More opportunities for experiencing science outside the classroom in more natural, outdoor environments

Link to Science Differentiation Chart and Accommodations Chart

Core and Supplementary Instructional Materials

Teacher Pedagogical Resources:

- FOSS Sound and Light teacher manual
- FOSS Sound and Light teacher toolkit and equipment kit
- FOSS technology website: www.FOSSweb.com

Student Materials:

- FOSS Science Resource books
- FOSS student textbook
- FOSS equipment kit

Course: BES Science Grade 1

Unit # 3: Plants and Animals

Grade Level(s): First Grade	**Length of Units: 32 days**

Unit Rationale:

This module provides experiences that heighten students' awareness of the way that plants and animals meet their basic needs. Students observe firsthand the structures of plants and discover ways to propagate new plants from mature plants (from seeds, bulbs, roots, and stem cuttings). They observe and describe changes that occur as plants grow, and compare classroom plants to those in the schoolyard. They design terrariums (habitat systems) and provide for the needs of both plants and animals living together in the classroom.

Students explore variation in the same kind of organism, including variation between young and adults. They learn about the behaviors of parents to help their young (offspring) survive. And they explore structure and function relationships as they sort different kinds of animal and plant structures.

Throughout the Plants and Animals Module, students engage in science and engineering practices by collecting and interpreting data to build explanations and designing and using tools to answer questions. Students gain experiences that will contribute to the understanding of the crosscutting concepts of patterns; cause and effect; systems and system models; and structure and function.

Stage 1 - Desired Results

Enduring Understandings:	**Essential Questions:**
Students will understand that… ● Seeds are alive and grow into new plants. ● Plants and animals live in different environments and have structures and behaviors that help them survive. ● Individuals of the same kind (of plant or animal) look similar but also vary in many ways. ● Plants grow and change. Plants can produce new plants in many ways. ● Adult animals can have young (offspring), and the young resemble their parents. ● Engineers learn from nature to solve problems. ● In many kinds of animals, parents and the offspring	● How do seeds grow? ● What plant structures allow plants to grow and survive? ● How can we make a new plant from an old one? ● What do animals need to grow and survive? ● What structures or behaviors do plants or animals have that help them live in their habitat? ● What do animal parents do to help their young survive?

engage in behaviors that help the offspring survive.	
Content: *Students will know…* ● Seeds need water to grow into new plants. ● Plant roots take in water and nutrients, and leaves make food from sunlight. ● Not all plants grow alike. ● Leaves, twigs, and roots develop on stems at nodes. ● Potatoes are underground stems; potato eyes are nodes where buds grow. ● New plants can grow from the stems of mature plants. ● Plants are living organisms that need water, air, nutrients, light, and space to grow. ● Animals need water, food, air, and space with shelter. ● A habitat is a place where plants and animals live. It provides what a plant or animal needs to live. ● Squirrels store food for winter survival. ● Animals use sensory structures to take in information about their surroundings and act on it. ● Plant bulbs are alive and grow new structures when provided with water. ● Some parts of roots will grow into new plants if they are provided with water. Other parts will not.	**Skills:** *Students will be able to…* ● Observe how seeds germinate and grow. ● Observe variations in the growth of the same kind of seed. ● Observe plant variations in the local environment. ● Use media to look at variation in animals. ● Identify ways that animals use their senses to gather information about their surroundings to help them survive. ● Make new plants from stems of houseplants and observe them grow. ● Set up and maintain terrariums using seeds, plants, and local animals. ● Compare and sort structures and functions of animals and plants. ● Identify variations in how squirrels store food for winter survival. ● Plant bulbs and observe how they develop into new plants. ● Plant parts of roots to identify which parts will develop into new plants. ● Adopt a schoolyard plant and compare it to other plants. ● Use media to learn how the behavior of animals and their young help the young to survive. ● Observe how young plants and animals resemble their parents.

Performance Expectations ("the Standards"):

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

1-LS1-2 Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

Connected components:

Science and Engineering Practices:

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Use materials to design a device that solves a specific problem or a solution to a specific problem. (1- LS1-1)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.

(1-LS1-2)

Disciplinary Core Ideas:

LS1.A: Structure and Function

- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1)

LS1.B: Growth and Development of Organisms

- Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage that help the offspring to survive. (1-LS1-2)

LS1.D: Information Processing

- Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1)

Crosscutting Concepts:

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (1-LS1-1)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world. (1-LS1-2)

Career Education (Career Readiness, Life Literacies, and Key Skills Practices and 9.2 Standards)

9.1.2.CAP.1: Make a list of different types of jobs and describe the skills associated with each job.

CLKS Practices:

1. Consider the environmental, social and economic impacts of decisions
2. Work productively in teams while using cultural/global competence

Connected Careers:

forest officer, ecologist

Explanation of how 9.2 standards connect to the unit:
Throughout the unit, students will be introduced to the many careers that highlight the diverse applications of zoology and botany in various industries, from conservation and agriculture to healthcare and education.

Explanation of how CLKSs connect to the unit:

1. **Consider the environmental, social and economic impacts of decisions:** During Earth Week, students explore the detrimental environmental effects of human interactions on plants and animals and their ecosystems.

2. **Work productively in teams while using cultural/global competence:** After studying the basic needs of plants and animals and how these are compromised through human interactions, students work in cooperative groups to brainstorm possible conservation strategies.

Explanation of how Connected Careers connect to the unit:
In this unit, students learn about the needs of plants(botany) and animals(zoology) to survive. Understanding these needs will help a forest officer determine sustainable forestry practices, wildlife habitat preservation, and forest health. Similarly an ecologist can study how environmental conditions can promote or undermine a healthy ecosystem for living things and create plans for their viability.

Interdisciplinary Standards
Math Connections:

- **MP.5.** Use appropriate tools strategically. (1-ESS1-2)

Literacy Connections:

- **RI.CR.1.1**. Ask and answer questions about key details in a text.
- **RI.TS.1.5**. Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.
- **W.IW.1.2** - With prompts and support, write informative/explanatory texts to examine a topic and convey ideas and information.
    G. Introduce topic
    H. Develop the topic with facts or other information and examples related to the topic.
    I. Provide a conclusion)

Explanation of how interdisciplinary standards connect to the unit:

- **MP.5. -** Using a ruler, students will record and graph the growth of grass seeds over a period of time.
- **W.IW.1.2**: Most science lessons end with a student or class-generated journal entry that reviews the information learned in that activity or lesson.
- **RI.CR.1.1**: Science lesson discussions always include opportunities for students to ask questions about concepts taught in related non-fiction texts and brainstorm possible answers.
- **RI.TS.1.4:** During the many read-aloud books used during this unit, students will determine if they are fiction or nonfiction, explore the various non-fiction text features used, as well as determine the different ways they present information.

Technology Integration (9.4 Standards):
9.4.2.CT.1: Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
9.4.2.IML.2: Represent data in a visual format to tell a story about the data (e.g., 2.MD.D.10).
9.4.2.IML.3: Use a variety of sources including multimedia sources to find information about topics such as climate change, with guidance and support from adults (e.g., 6.3.2.GeoGI.2, 6.1.2.HistorySE.3, W.2.6, 1-LSI-2).

Explanation of how 9.4 standards connect to the unit:
9.4.2.CT.1/9.4.2.IML.3: Through non-fiction texts and videos, Students will research pollution concerns in our

environment and how they affect the plants and animals in our world. They will brainstorm ways to conserve energy and natural resources. Target questions include:"How can we help keep our Earth clean?", "What can we do to save energy?" Working in collaborative groups, students will create posters of their ideas to share with others.
9.4.2.IML.2: After monitoring and recording the growth of grass seeds over an extended period, students will create a bar graph to represent the growth data gathered. Students will compare and contrast information from these graphs.

Stage 2- Assessment Evidence:	
Assessment:	
Formative	**Lab experiments:** Use science journals to check student understanding of entries. **Focus Questions:** Students summarize their learning at the end of each lab experiment. **Response Sheet:** Students provide content to answer a provided question. Evidence for answer is required. **Science Journal Check:** Students record data in their science journals that describes the results during each lab. Journals are collected and assessed. **Science Notes:** Throughout the unit, students fill in content provided in the notes to act as the student textbook. Students may use prepared *notebook sheets* or may generate *free-form notebook entries* that could both be collected and assessed for student progress. **Teacher observation**: occurs on a daily basis and provides continuous monitoring of students' learning **Student participation**: observation of students' actions and engagement
Summative	**I-Check Performance Assessments:** These are teacher-prepared formal assessments that are appropriate for the students. They are up to one period in length and are taken individually. They are given at the end of the Investigation. This is a performance-based assessment. **Survey/Posttest:** A full-period assessment which consists of content questions, multiple choice, fill-in-the-blank, and open-response questions.
Alternative	**Response Sheet:** Students provide illustrations to answer a provided question and will verbally explain their understanding of the given concept **Tutorials/Virtual Investigations:** Virtual simulations are provided for each investigation to enrich lab experiences
Benchmark	***I-Checks* Benchmark Assessments**
Other (optional)	

Stage 3 - Learning Plan	
Learning Activities: **- Investigation 1:** Grass and Grain Seeds **- Investigation 2:** Stems	**Differentiation:** Active science itself provides many opportunities for differentiated instruction and is designed to maximize the science-learning opportunities. Students are allowed to

- Investigation 3: Terrariums
- Investigation 4: Growth and Change

Related Application/Connection/Extension problems (Inv 1)

- **Investigation 1, Part 1:** Lawns
- **Investigation 1, Part 2:** Growing Lawns
- **Investigation 1, Part 3:** Wheat
- **Investigation 1, Part 4:** Variations in Plants and Animals

Related Application/Connection/Extension problems (Inv 2)

- **Investigation 2, Part 1:** Rooting Stem Cuttings
- **Investigation 2, Part 2:** Spuds
- **Investigation 2, Part 3:** New Plants from Cuttings

Related Application/Connection/Extension problems (Inv 3)

Investigation 3, Part 1: Setting Up Terrariums
- **Investigation 3, Part 2:** Animals in the Terrariums
- **Investigation 3, Part 3:** Habitat Match
- **Investigation 3, Part 4:** Squirrel Behaviors

Related Application/Connection/Extension problems (Inv 4)

- **Investigation 4, Part 1:** Planting Bulbs
  Investigation 4, Part 2: Planting Roots
  Investigation 4, Part 3: Plant and Animal Growth

express their understanding through a variety of modalities and will have multiple opportunities to demonstrate their strengths and needs and then participate in the appropriate follow-up experiences:

ELL:
- Provide detail-rich illustrations with labels of concepts taught
- More opportunities for experiencing science outside the classroom in more natural, outdoor environments
- Scaffolding their learning through graphic organizers and word banks
- Making vocabulary more explicit through new concrete experiences or reading passages
- Provide opportunities to work with mentor-partner

G&T:
- Designing individual projects or small-group investigations

Special Ed:
- More time with the active investigations or online activities
- More opportunities for experiencing science outside the classroom in more natural, outdoor environments
- Student-dictated responses or illustrations to demonstrate concept understanding
- Provide opportunities to work with mentor-partner

504:
- More time with the active investigations or online activities

Students at Risk:
- More time with active investigations or online activities
- More experience building explanations of the science concepts orally or in writing or drawing

A variety of strategies are used to reach all types of learners. For a complete list Click Here.

Link to Science Differentiation Chart and Accommodations Chart

Core and Supplementary Instructional Materials

Teacher Pedagogical Resources:

- FOSS Plants and Animals teacher manual
- FOSS Plants and Animals teacher toolkit and equipment kit
- FOSS Science Resource books
- FOSS technology website: www.FOSSweb.com
- Bedwell Garden

Student Materials:

- FOSS student textbook
- FOSS Science Resource books
- FOSS Plants and Animals equipment kit
- Bedwell Garden (soil, seeds, gardening tools)

Notes:
Inclusion of Climate Change Opportunities

Students will look at data that indicates the impacts humans have on land, water, air, and/or other living things in the local environment and describe the key ideas that are presented in the data.

Plants and Animals Pacing Guide

Time Period				
October/ November	**Investigation 1, Part 3:** Wheat	**Investigation 3, Part 4:** Squirrel Behaviors	**Investigation 4, Part 1:** Planting Bulbs in school garden	
April	**Investigation 1, Part 1:** Lawns	**Investigation 1, Part 2:** Growing Lawns	**Investigation 1, Part 4:** Variations in Plants and Animals	**Investigation 2, Part 1,2,3:** Rooting Stem Cuttings,Spuds, New Plants from Cuttings

May	**Investigation 3, Part 1:** Setting Up Terrariums	**Investigation 3, Part 2,3:** Animals in the Terrariums and Habitat Match	**Investigation 4, Part 2:** Planting Roots	**Investigation 4, Part 3:** Plant and Animal Growth