First Grade

Science Curriculum

Francis Howell School District

HOME SCHOOL COMMUNITY

LEARNING TOGETHER

Board Approved:

July 19, 2018

Francis Howell School District

Mission Statement

The mission of the Francis Howell School District is to prepare students today for success tomorrow.

Vision Statement

Every student will graduate with college and career readiness skills.

Values

Francis Howell School District is committed to:

- Providing a consistent and comprehensive education that fosters high levels of academic achievement
- Operating safe and well-maintained facilities
- Providing a safe learning environment for all students
- Promoting parent, community, student, and business involvement in support of the school district
- Ensuring fiscal responsibility
- Developing responsible citizens
- Operating as a professional learning community
- Making appropriate use of technology

Francis Howell School District Graduate Goals

Upon completion of their academic study in the Francis Howell School District, students will be able to:

1. Gather, analyze and apply information and ideas.
2. Communicate effectively within and beyond the classroom.
3. Recognize and solve problems.
4. Make decisions and act as responsible members of society.

Science Graduate Goals

Upon completion of their Science study in the Francis Howell School District, students will be able to:

- Use Scientific and Engineering Practices to understand how scientific knowledge develops and the work of engineers, as well as the links between engineering and science. These practices include:
    - Asking questions (for science) and defining problems (for engineering)
    - Developing and using models
    - Planning and carrying out investigations
    - Analyzing and interpreting data
    - Using mathematics and computational thinking
    - Constructing explanations (for science) and designing solutions (for engineering)
    - Engaging in argument from evidence
    - Obtaining, evaluating, and communicating information
- Develop an understanding of, and be able to explain, concepts that bridge disciplinary boundaries, including:
    - Patterns
    - Cause and effect: Mechanism and explanation
    - Scale, proportion, and quantity
    - Systems and system models
    - Energy and matter: Flows, cycles, and conservation
    - Structure and function
    - Stability and change
- Use scientific knowledge to understand the world in four major domains:
    - Physical sciences (Matter and its interactions, Motion and Stability, Energy, Waves and Their Applications)
    - Life sciences (From Molecules to Organisms, Ecosystems, Heredity, Biological Evolution)
    - Earth and space sciences (Earth's Place in the Universe, Earth's Systems, Earth and Human Activity)
    - Engineering, technology, and the applications of science (Engineering Design, Links among Engineering, Technology, Science, and Society)

Rationale for Elementary Science

Science, engineering, and technology permeate nearly every facet of modern life, and they also hold the key to meeting many of humanity's most pressing current and future challenges. The overarching goal of science education is to ensure that all students have some appreciation of the beauty and wonder of science; possess sufficient knowledge of science and engineering to engage in public discussions on related issues; are careful consumers of scientific and technological information related to their everyday lives; are able to continue to learn about science outside of school; and have the skills to enter careers of their choice, including (but not limited to) careers in science, engineering, and technology. Elementary science in Francis Howell School District will develop student understandings and skills which are necessary for them to function productively as problem-solvers in a scientific and technological world, cultivate students' scientific and engineering habits of mind, develop their capability to engage in scientific and engineering practices, and teach them how to reason in the contexts of science, engineering, and technology.

First Grade Science Course Description

First Grade Science is designed to explore Structures, Functions, and Information Processing in Life Science, Space Systems' Patterns and Cycles, and Waves in Terms of Light and Sound. Students will develop understanding of the relationship between sound and vibrating materials as well as between the availability of light and ability to see objects. The idea that light travels from place to place can be understood by students at this level through determining the effect of placing objects made with different materials in the path of a beam of light. Students develop understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs as well as how behaviors of parents and offspring help the offspring survive. The understanding is developed that young plants and animals are like, but not exactly the same as, their parents. Students observe, describe, and predict some patterns of the movement of objects in the sky. The crosscutting concepts of patterns; cause and effect; structure and function; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In first grade, students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

K-3 Science Curriculum Team

Curriculum Committee

Sara Abney	Central Elementary
Melissa Barth	Harvest Ridge
Becky Bee	Fairmount
Brittany Booth	Fairmount
Samantha Calise-Moody	Daniel Boone
Teresa Gilstrap	Becky-David
Robyn Heimburger	Castlio
Melissa Kirchoff	Fairmount
Christie Kolath	Becky-David
Katie Lenz	Daniel Boone
Rebecca Lewis	Harvest Ridge
Kim Ostertag	Independence
Rainah Pray	Becky-David
Kelly Peterson	Central Elementary
Angela Regan	Harvest Ridge
Karen Ruzicka	Warren
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Academics and Administration

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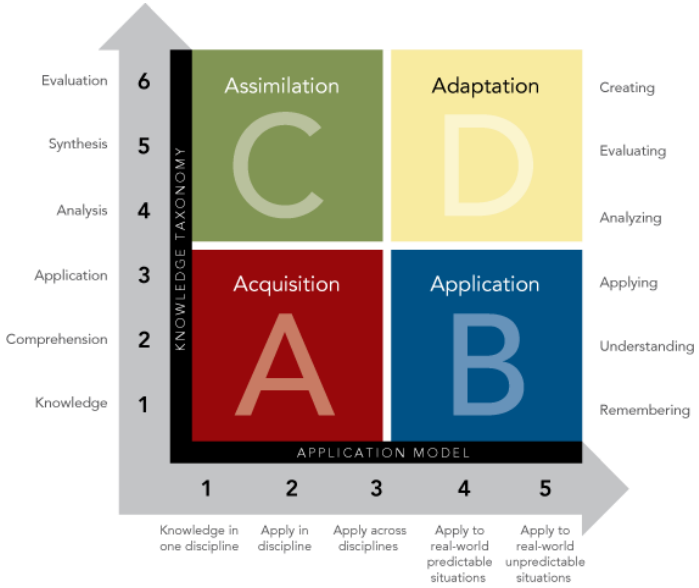
Curriculum Notes

All FHSD performance tasks and sample learning activities are aligned not only to understandings and standards, but also the Rigor and Relevance Framework and 21st Century Skills. Information on these two things is provided below or by clicking on the hyperlinks.

Rigor and Relevance Framework

The Rigor/Relevance Framework is a tool developed by the International Center to examine curriculum, instruction, and assessment along the two dimensions of higher standards and student achievement.



The Rigor/Relevance Framework has four quadrants.
Quadrant A represents simple recall and basic understanding of knowledge for its own sake. Examples of Quadrant A knowledge are knowing that the world is round and that Shakespeare wrote Hamlet.

Quadrant C represents more complex thinking but still knowledge for its own sake. Quadrant C embraces higher levels of knowledge, such as knowing how the U.S. political system works and analyzing the benefits and challenges of the cultural diversity of this nation versus other nations.

Quadrants B and D represent action or high degrees of application. Quadrant B would include knowing how to use math skills to make purchases and count change. The ability to access information in wide-area network systems and the ability to gather knowledge from a variety of sources to solve a complex problem in the workplace are types of Quadrant D knowledge.

A	B	C	D
Students gather and store bits of knowledge and information. Students are primarily expected to remember or understand this knowledge.	Students use acquired knowledge to solve problems, design solutions, and complete work. The highest level of application is to apply knowledge to new and unpredictable situations.	Students extend and refine their acquired knowledge to be able to use that knowledge automatically and routinely to analyze and solve problems and create solutions.	Students have the competence to think in complex ways.

21st Century Skills

These skills have been pared down from 18 skills to what are now called the 4Cs. The components include critical thinking, communication, collaboration, and creativity. Critical thinking is focused, careful analysis of something to better understand and includes skills such as arguing, classifying, comparing, and problem solving. Communication is the process of transferring a thought from one mind to others and receiving thoughts back and includes skills such as choosing a medium (and/or technology tool), speaking, listening, reading, writing, evaluating messages. Collaboration is working together with others to achieve a common goal and includes skills such as delegating, goal setting, resolving conflicts, team building, decision-making, and managing time. Creativity is expansive, open-ended invention and discovery of possibilities and includes skills such as brainstorming, creating, designing, imagining, improvising, and problem-solving.

Standards

Standards aligned to this course can be found:

Science Standards

http://www.nextgenscience.org/overview-topics

https://dese.mo.gov/sites/default/files/curr-mls-standards-sci-k-5-sboe-2016.pdf

Units & Standards Overview

Quarter 1 **Quarter 2** **Quarter 3** **Quarter 4**

Unit 1: Where are We?	Unit 2: Light and Sound	Unit 3: Structure and Function
NGSS 1-ESS1-1/MO 1.ESS1.A.2 NGSS 1-ESS1-2/MO K.ESS1.B.1 CCC1 SEP1 SEP2 SEP3 SEP4	NGSS 1-PS4-1/MO 1.PS4.A.1 NGSS 1-PS4-2. NGSS 1-PS4-3. NGSS 1-PS4-4/MO 1.PS4.C.1 CCC2 SEP1 SEP2 SEP3 SEP6	NGSS 1-LS1-1/MO 1.LS1.A.1 NGSS 1-LS1-2 NGSS 1-LS3-1/MO 1.LS3.A.1 CCC1 CCC6 SEP1 SEP2 SEP6 SEP8

Course Map

	Unit Description	PE Standards
Unit 1: Where are We? **4-5 weeks**	Students are able to observe, describe, and predict some patterns of the movement of objects in the sky. The crosscutting concepts of patterns are discovered through exploration of natural phenomena. Students will create models based on their understanding of the patterns created by the sun, moon, and stars. They will plan and carry out investigations based on their models. They will then apply their understanding to make predictions about how the sun, moon, and stars look at different times of the year.	**1-ESS1-1** **CCC1** (patterns) **SEP4** (analyzing & interpreting data)

Unit 2: Light and Sound **4-5 weeks**	During the study of light and sound waves students will develop their science skills through inquiry, prediction, observation, exploration, discussion, and recording. These lessons focus on students collaboratively problem solving, discovering, and investigating to find answers and solutions. Students will discover phenomena involving sound, vibration, illumination, light beam paths and communication. They will create models for how they think the phenomenon works. Finally, they will conduct experiments based on their models that will require engineering and problem solving. These lessons were designed to allow students to make their own predictions and observations while testing and recording their findings.	**1-PS4-1** **CCC2** (cause and effect) **SEP1** (asking questions and defining problems) **SEP2** (developing and using models)
Unit 3: Structure and Function **4-5 weeks**	During the study of structure and function students will explore how people learn from animals and plants to help solve human problems. These lessons focus on engineering based on learning about the different structures and functions of animals and plants. Students are expected to develop understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs as well as how behaviors of parents and offspring help the offspring survive. The understanding is developed that young plants and animals are like, but not exactly the same as, their parents. Students will discover phenomena involving plants and animals, create models, and conduct engineering experiments.	**1-LS1-1** **CCC6** (structure and function) **SEP6** (constructing explanations and designing solutions)

Unit 1: Where Are We?

Content Area: Science	Course: First Grade	UNIT: Where Are We?

Unit Description:	Unit Timeline:
Students are able to observe, describe, and predict some patterns of the movement of objects in the sky. The crosscutting concepts of patterns are discovered through exploration of natural phenomena. Students will create models based on their understanding of the patterns created by the sun, moon, and stars. They will plan and carry out investigations based on their models. They will then apply their understanding to make predictions about how the sun, moon, and stars look at different times of the year. **Anchor Chart**	4-5 weeks (30 minutes a day)

DESIRED Results

Transfer Goal - ***Students will be able to independently use their learning to……***

1. **Ask questions and define problems:** Ask questions based on observations to find more information about the natural and/or designed world(s). Ask and/or identify questions that can be answered by an investigation.
2. **Develop and use models:** Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s). Develop a simple model based on evidence to represent a proposed object or tool. Compare models to identify common features and differences.
3. **Plan and carry out investigations:** Make observations (firsthand or from media) to collect data that can be used to make comparisons.
4. **Analyze and interpret data:** Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.

Understandings – *Students will understand that… (Big Ideas)*

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

Essential Questions: ***Students will keep considering…***

- How can we use patterns to help us predict?
- Do objects in the sky have patterns?
- How does the earth's position in relation to the sun change the length of daylight?
- Why can't we see stars (other than the sun) in daylight?

STANDARDS ADDRESSED

Highlighted standards are included in the sample activities in this curriculum. Standards not covered in the sample activities will need to be addressed through additional activities in the classroom.

Students who demonstrate understanding can:

1-ESS1-1/MO 1.ESS1.A.2. Use observations of the sun, moon, and stars to describe patterns that can be predicted. [Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.] [Assessment Boundary: Assessment of star patterns is limited to stars being seen at night and not during the day.]

1-ESS1-2/MO K.ESS1.B.1. Make observations at different times of year to relate the amount of daylight to the time of year. [Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.] [Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.]

Disciplinary Core Ideas **Students will know...**	**Cross Cutting Concepts** **Students will understand…**	**Science and Engineering Practice** **Students will be able to...**
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)	**CCC1: Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested. ● Ask questions based on observations to find more information about the natural and/or designed world(s). ● Ask and/or identify questions that can be answered by an investigation. **SEP2: Developing and Using Models** Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

		● Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s). ● Develop a simple model based on evidence to represent a proposed object or tool. **SEP4: 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)
ESS1.B: Earth and the Solar System Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)	**CCC1: Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-2)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested. ● Ask questions based on observations to find more information about the natural and/or designed world(s). ● Ask and/or identify questions that can be answered by an investigation. **SEP2: Developing and Using Models** Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. ● Compare models to identify common features and differences. **SEP3: 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)

Unit 1 (Where Are We?): Assessment

EVIDENCE of LEARNING			
Understanding	Standards	**Unit Performance Assessment**: Unit 1 Pre/Post Assessment **Scoring Guide:** *Included in Assessment document*	**R/R Quadrant 21 Century** A/B/D
1	**1-ESS1-1** **CCC1** (patterns) **SEP4** (analyzing & interpreting data)		Critical Thinking, Creativity

Unit 1 (Where Are We?): Sample Activities

SAMPLE LEARNING PLAN
Pre-assessment: *Watch the video (link). Follow instructions for pre-assessment*
Anchoring Phenomena for this Unit: Phenomena Listed In this Unit: ● Dubai Timelapse ● Why can't we see stars during the day? ● Why do our shadows move during the day? ● Sunrise/Sunset Video ● St. Charles Sunrise/Sunset Graph 2018 ● St. Charles Temperature Graph Other Possible Phenomena: ● Make physical model ● Total solar eclipse ● See moon in daytime

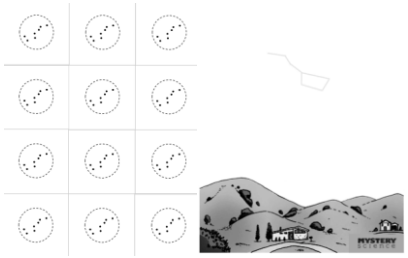
- Seeing the stars
- Seeing the Milky Way
- Sunrise/Sunset
- Time change- why is it dark in the early evening and dark in the morning?
- Colors during sunset
- See stars at sunset
- Why is space black?
- In the winter when the sun is out, why am I cold?
- Why does the moon change?
- Why is the moon orange (Harvest Blood)?

This curriculum is based on the Next Generation Science Standards. For clarification on the standards, please visit the Wonder of Science website. Go to the standards tab to find your grade level and unit. After clicking on the unit, you will see a list of standards students should learn that you can click. After clicking on the standard then the evidence link, you will find a clarification statement as well as the practices you should take the standard through. Also included are observable features of student performance by the end of the grade that will help indicate whether or not the student has met the standard.

This unit outlines how to take one of the content objectives from each unit through a specific inquiry process using the 3-dimensional learning outlined in our standards and gives sample activities that would ensure the objective is taught to students. Many of the sample activities in this unit have *Asking and Answering Questions* and *Developing a Model* in addition to the other scientific practices found in the evidence section. We added these two practices to use as a pre-assessment and to see what the students already know and understand about the standard to guide our instruction. Some, but not all, objectives are outlined in the samples; it will be up to you to look at the objectives that are not addressed in this document and make plans accordingly.

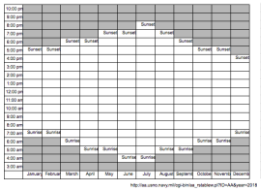
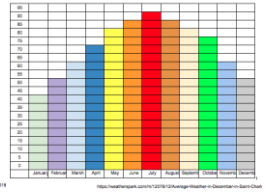
Understanding	**Standards**	**Major Learning Activities:**	**Instructional Strategy:**	**R/R Quadrant: 21C:**
1	**1-ESS1-1** **CCC1** (patterns) **CCC2** (cause and effect) **SEP1** (asking	**1. Title: Asking Questions and Developing a Model (Pre-Assessment and lesson)** **Objectives**: ● Students will ask questions about patterns of the movement of the sun, moon, and stars in the sky that can be observed, described, and predicted. ● Students will develop a model about patterns of the movement of the sun, moon, and stars in the sky that can be observed, described, and predicted. ○ Sample Student Friendly Objective: ■ We will be able to ask questions about the patterns of		A/B Critical Thinking, Creativity

	questions and defining problems) **SEP2** (developing and using models)	the sun, moon, and stars. **Description**: a. The teacher will introduce the unit's anchoring phenomena by showing the video of a 24-Hour Time Lapse in Dubai. The first time you show the video, have the students watch and begin thinking about questions they have about the moon, earth, star and sun. b. The students will watch the video and on the back of their pre-assessment paper, they will develop a list of questions they have. c. The teacher will play the video multiple times while students compile their questions. (Follow the Pre-Assessment Protocol) d. When the students are done writing at least two questions, they will turn their paper over and begin to develop a model by drawing a picture of how the anchoring phenomena works (The Video of 24 Hour Time Lapse). e. Once the students are done with the pre-assessment, have them turn and talk with a partner about their model. f. Next, the teacher will have students share their questions with the class. g. The teacher will develop a classroom anchor chart with a list of questions that the students have about the phenomena. **Appendix Documents**: Dubai Timelapse Pre-Test Model Paper Pre/Post Assessment Protocols	Advance Organizer Non-Linguistic Representation Cooperative Learning	

1	**1-ESS1-1** **CCC1** (patterns) SEP3 (planning and carrying out investigations)	**2. Title: Planning and Carrying Out Investigations <u>(60 minute lesson or a 2 day/30 minute lessons)</u>** **Objective**: ● Students will plan and carry out an investigation about patterns of the movement of the sun, moon, and stars in the sky that can be observed, described, and predicted. ○ Sample Student Friendly Objective: ■ We will be able to investigate the pattern of why we cannot see the stars during the day but can at night. **Description:** a. The teacher will introduce the phenomena: Why can't we see the stars during the day? b. Students will engage in a quick turn and talk to develop a list of questions they have about why they cannot see the stars during the day. c. The teacher will have students share a few questions they have. d. The students will quickly develop a model on a whiteboard (they will edit the model as they learn). e. The teacher will bring up *Why do the Stars Come Out at Night* on Mystery Science (in the first grade *Spinning Sky* unit). f. Follow the Mystery Science slides to complete the investigation. g. After completing *Why do Stars Come Out at Night* investigation, the students will revisit their original model drawn on the whiteboard. They will make edits based on their new understanding. h. The teacher will have students share out how their models changed. i. Teacher will create or uncover the part of the chart where the stick person is standing on the earth at night (bottom right). **Materials:** flashlights with one bright LED, dixie cups, tape, push pins, scissors **Appendix Documents**: print out of constellation, sky paper, Mystery Science, Anchor Chart 	Cooperative Learning Non-Linguistic Representation Similarities and Differences	A/C/D Collaboration, Critical Thinking, Creativity

1	**1-ESS1-1** **CCC1** (patterns) SEP3 (planning and carrying out investigations)	**3. Title:Planning and Carrying Out Investigations/ Analyzing and Interpreting Data (60 minute lesson or a 2 day/30 minute lessons)** **Objective**:Students will plan and carry out an investigation about patterns of the movement of the sun, moon, and stars in the sky that can be observed, described, and predicted. ● Sample Student Friendly Objective: We will be able to investigate the pattern of the sun at different times of the day using our shadows. **Description**: a. The teacher will introduce the phenomena: Why do our shadows move during the day? b. Students will engage in a quick turn and talk to develop a list of questions they have about why shadows move? c. The teacher will have students share a few questions they have. d. The students will quickly develop a model on a whiteboard (they will edit the model as they learn). e. Have students pair up and trace each other's shadows in chalk- first thing in the morning, then in the afternoon. Use different colors for different times of day. Be sure students trace around their shoes first and write their names next to their shadows. (Optional Technology integration - have students take pictures on SeeSaw each time they trace their shadow. They can provide an audio caption about what they are noticing) f. Near each shadow, have students draw an arrow to where the sun is in the sky at that time of the day. g. Each time you take the students outside to draw their shadow, allow for time in the classroom to record their observations of the shadows and the sun on their observation sheet for the morning and afternoon boxes. Students need to include where the sun is located. h. At the end of the day, ask students why they think their morning and afternoon shadows pointed in different directions. Have the students draw where they think their shadow and the sun will be at sunrise and sunset. i. After completing the shadow investigation, the students will revisit their original model drawn on the whiteboard. They will make edits based on their new understanding. j. The teacher will have students share out how their models changed. k. Teacher will create or uncover the part of the anchor where the stick person is standing on the earth during the daytime (bottom left). **Materials:** Chalk, SeeSaw App, I-Pad, Observation paper **Appendix Documents**: Anchor Chart	Cooperative Learning Non-Linguistic Representation Summarizing and Notetaking Similarities and Differences Generating and Testing Hypothesis	A/C/D 21C Collaboration, Critical Thinking, Creativity

1	**1-ESS1-1** **CCC1** (patterns) SEP3 (planning and carrying out investigations)	**4. Title: Planning and Carrying Out Investigations** **Objective**: Objective:Students will plan and carry out an investigation about patterns of the movement of the sun, moon, and stars in the sky that can be observed, described, and predicted. ● Sample Student Friendly Objective: We will be able to predict and investigate the patterns of the sun and moon using a globe, tennis ball, and flashlight. **Description**: a. Teacher will show the sunrise and sunset video (see example links below) and introduce the phenomena: What observations do you see in the sky during sunrise and sunset? b. Students will collaboratively draw a model on a whiteboard to show their understanding of our sky during sunrise and sunset and what is happening with the sun, earth, and moon. Students will need to label the sun, earth, and moon. c. Students will share their model ideas with each other. d. Student pairs will experiment with a globe, tennis ball, and a flashlight. As students shine their flashlight on one side of the globe, encourage them to make observations about the other side of the globe. e. The teacher will guide students to create a model (i.e. paper and brad model) of the sun, earth, and moon. Teacher will demonstrate how the earth rotates resulting in only part of the earth to be facing the sun (day) while the other side is not (night). f. After completing the investigations, students will revisit the original model on their whiteboard. They will make edits based on their new understanding and share out how their model changed. g. Teacher will create or uncover the part of the anchor chart with the moon and earth showing day and night (upper right-hand side). **Materials:** Globe, tennis ball, flashlights (at least one per group or pair), paper and brad model - (or another physical model) see link below, Example of paper and brad model can be seen: Paper and Brad Model **Appendix Documents**: Sunrise/Sunset timelapse videos: Sunrise to Sunset from House Roof Dubai Timelapse Anchor Chart	Advance Organizer Non-Linguistic Representation Non-Linguistic Representation Non-Linguistic Representation	A/C/D 21C Collaboration, Critical Thinking, Creativity

1	1-ESS1-2 **CCC1** (patterns) **SEP4** (analyzing and interpreting data)	**5. Title: Analyzing and Interpreting Data** **Objective**: Students will analyze and interpret data by observing patterns of daylight at different times of the year. ● Sample Student Friendly Objective: We will understand the patterns of daylight at different times of the year. **Description**: a. Teacher will display the St. Charles Sunrise/Sunset Graph. b. Students will ask questions while turning and talking with a partner. c. Teacher will ask some pairs to share their questions. d. Teacher will ask students what they noticed about the Graph; discuss and explain--making sure to include that there is more daylight in the summer and less daylight in the winter. e. Repeat above steps with the St. Charles Temperature Graph; make sure to connect how the Graphs are related. Again, emphasizing the difference between winter daylight/temperature and summer daylight/temperature. f. Teacher will create or uncover the rest of the anchor chart. **Appendix Documents:** St. Charles Sunrise/Sunset Graph 2018 St. Charles Temperature Graph Anchor Chart  	Advance Organizer Cooperative Learning Similarities and Differences	A/B/D Collaboration, Critical Thinking
1	**1-ESS1-1** **CCC1** (patterns) **SEP2** (developing and using models)	**6. Title: Developing a Model (Post-Assessment)** **Objectives**: ● Students will develop a model about patterns of the movement of the sun, moon, and stars in the sky that can be observed, described, and predicted. ○ Sample Student Friendly Objective: We will be able to create a revised model, using what we learned from this unit, about the patterns of the sun, moon, and stars.		B/D Collaboration, Critical Thinking, Creativity

UNIT RESOURCES
Teacher Resources: ● Mystery Science ● Wonder of Science website ● STEM-Gauge-K-2-Life-Science ● See Appendix Documents under each lesson
Student Resources: ● Dry/erase boards ● Dry/erase markers ● See Appendix Documents under each lesson
Vocabulary: pattern - repeated design or recurring sequence investigate - to try to find out facts about something in order to learn how it happened predict - to make a guess about something you think will happen phenomena - a rare or significant fact or event sunrise - the first light of day when the sun rises above the horizon sunset - the last light of day as the sun descends/disappears below the horizon

Unit 2: Light and Sound

Content Area: Science	Course: First Grade	UNIT: Ride the Wave: Light and Sound

Unit Description:	Unit Timeline:
During the study of light and sound waves students will develop their science skills through inquiry, prediction, observation, exploration, discussion, and recording. These lessons focus on students collaboratively problem solving, discovering, and investigating to find answers and solutions. Students will discover phenomena involving sound, vibration, illumination, light beam paths and communication. They will create models for how they think the phenomenon works. Finally, they will conduct experiments based on their models that will require engineering and problem solving. These lessons were designed to allow students to make their own predictions and observations while testing and recording their findings. **Anchor Chart**	4-5 weeks (30 minutes per day)

DESIRED Results

Transfer Goal - ***Students will be able to independently use their learning to……***

1. **Ask questions and define problems**: Ask and/or identify questions that can be answered by an investigation. Ask questions based on observations to find more information about the natural and/or designed world(s). Define a simple problem that can be solved through the development of a new or improved object or tool.
2. **Develop and use models**: Compare models to identify common features and differences. Develop a simple model based on evidence to represent a proposed object or tool.
3. **Plan and carry out investigations**: Make observations (firsthand or from media) to collect data that can be used to make comparisons.
6. **Construct Explanations and Design Solutions**: Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. Use tools and materials provided to design a device that solves a specific problem.

Understandings (Cross Cutting Concepts) – *Students will understand that… (Big Ideas)*

2. (Cause and Effect) Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Essential Questions: ***Students will keep considering…***

- How does sound travel?
- How does light travel?
- What effects illumination?
- How does light change the way we see things?
- What are sound waves?
- How do we solve the problem of communication over a distance without modern technology?

STANDARDS ADDRESSED		
Students who demonstrate understanding can: **1-PS4-1/MO 1.PS4.A.1 . Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate**. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.] 1-PS4-2. Make observations to construct an evidence-based account that objects can be seen only when illuminated. [Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.] 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. [Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).] [Assessment Boundary: Assessment does not include the speed of light.] 1-PS4-4/MO 1.PS4.C.1. Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. [Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string “telephones,” and a pattern of drum beats.] [Assessment Boundary: Assessment does not include technological details for how communication devices work.]		
Disciplinary Core Ideas **Students will know...**	**Cross Cutting Concepts** **Students will understand…**	**Science and Engineering Practice** **Students will be able to...**
PS4.A: Wave Properties Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1)	**CCC2: Cause and Effect** ● Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-1)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested. ● Ask and/or identify questions that can be answered by an investigation. **SEP2: Developing and Using Models** Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. ● Compare models to identify common features and differences. SEP3: 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)
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)	**CCC2: Cause and Effect** ● Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-2)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested. ● Ask questions based on observations to find more information about the natural and/or designed world(s). ● Ask and/or identify questions that can be answered by an investigation. **SEP2: Developing and Using Models** Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. ● Compare models to identify common features and differences. ● Develop a simple model based on evidence to represent a proposed object or tool. **SEP6: 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)
PS4.B: Electromagnetic Radiation 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	**CCC2: Cause and Effect** ● Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-3)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested. ● Ask and/or identify questions that can be answered by an investigation. ● Define a simple problem that can be solved through the

cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (1-PS4-3)		development of a new or improved object or tool. **SEP2: Developing and Using Models** Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. ● Develop a simple model based on evidence to represent a proposed object or tool. SEP3: 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-PS4-3)
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)		**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested. ● Define a simple problem that can be solved through the development of a new or improved object or tool. **SEP2: Developing and Using Models** Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. ● Develop a simple model based on evidence to represent a proposed object or tool. **SEP 6: 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. ● Use tools and materials provided to design a device that solves a specific problem. (1-PS4-4)

Unit 2 Ride the Wave (Light and Sound): Assessment

EVIDENCE of LEARNING			
Understanding 2	Standards **1-PS4-1** **CCC2** (cause and effect) **SEP1** (asking questions and defining problems) **SEP2** (developing and using models)	**Unit Performance Assessment**: **Description of Assessment Performance Task(s):** Sound Waves Performance Task **Scoring Guide:** *Included in Assessment document*	**R/R Quadrant 21 Century** A/C Critical Thinking, Creativity

Unit 2 (Light and Sound): Sample Activities

SAMPLE LEARNING PLAN
Pre-assessment: *Watch the video (link). Follow instructions for pre-assessment*
Anchoring Phenomena for this Unit: Phenomena Listed In This Unit: ● sound wave video ● How can a rubber band cause sound ● Visualizing vibrations ● What makes your throat vibrate when you hum? ● Move rice with sound/pan: ● Move sprinkles with voice: ● Move rice or sprinkles with sound/speaker: ● How can we see inside a cave? ● Video Caver ● Spelunking Video ● How can we see outside when there are clouds? ● How can we communicate with people who are far away? Other Possible Phenomena: ● Shadows ● Prisms change path of light ● Nocturnal animals - cat eye reflection ● fireflies/lightning bugs ● Rainbows and moonbows ● Lightning before thunder ● Hearing without seeing ● Glow lights ● Telephone cups ● Rubber bands make different noises when stretched ● musical instruments ● mirrors/backwards and funny mirrors ● Whales communicating over long distances ● Snare drum
This curriculum is based on the Next Generation Science Standards. For clarification on the standards, please visit the Wonder of Science website. Go to the standards tab to find your grade level and unit. After clicking on the unit, you will see a list of standards students should learn that you can click. After clicking on the standard then the evidence link, you will find a clarification statement as well as the practices you

should take the standard through. Also included are observable features of student performance by the end of the grade that will help indicate whether or not the student has met the standard.

This unit outlines how to take one of the content objectives from each unit through a specific inquiry process using the 3-dimensional learning outlined in our standards and gives sample activities that would ensure the objective is taught to students. Many of the sample activities in this unit have *Asking and Answering Questions* and *Developing a Model* in addition to the other scientific practices found in the evidence section. We added these two practices to use as a pre-assessment and to see what the students already know and understand about the standard to guide our instruction. Some, but not all, objectives are outlined in the samples; it will be up to you to look at the objectives that are not addressed in this document and make plans accordingly.

Understanding	Standards	Major Learning Activities:	Instructional Strategy:	R/R Quadrant: 21C:
2	**1-PS4-1** **CCC 2** (cause and effect) **SEP 1** (asking questions and defining problems) **SEP 2** (developing and using models)	**1. Title: Asking Questions and Developing a Model (Pre-Assessment and lesson)** **Objectives**: ● Students will ask questions about the cause and effect of vibrating materials and sound. ● Students will develop a model about the cause and effect of vibrating materials and sound. ○ Sample Student Friendly Objectives: ■ We will be able to develop a model that explains how the glass breaks. ■ We will be able to ask questions about what makes the glass breaks **Description**: a. The teacher will introduce the unit's anchoring phenomena by showing the sound wave video with sound. The first time you show the video, have the students watch and begin thinking about questions they have about the glass breaking. b. The students will watch the video and on the back of their pre-assessment paper, they will develop a list of questions they have. c. The teacher will play the video multiple times while students compile their questions. (Follow the Pre-Assessment Protocol) d. When the students are done writing at least two questions, students will turn their paper over and begin to develop a model by drawing a picture of how the anchoring phenomena works (Sound Wave Video). e. Once the students are done with the pre-assessment, have them turn and talk with a partner about their model.	Advance Organizer Cooperative Learning	A/C Collaboration, Critical Thinking, Creativity

		f. Next, the teacher will have students share their questions with the class. g. The teacher will develop a classroom anchor chart with a list of questions that the students have about the phenomena. **Appendix Documents**: Sound Waves Video Pre/Post Assessment Protocol Pre-Assessment Model		
2	**1-PS4-1** **CCC2** (cause and effect) **SEP1** (asking questions and defining problems) **SEP2** (developing and using models) SEP3 (planning and carrying out investigations)	**2. Title: Planning and Carrying out Investigations (60 minute or a two-day lesson)** **Objective**: ● Students will plan and carry out an investigation on the cause and effect that vibrating materials can make sound and that sound can make materials vibrate. ○ Sample Student Friendly Objective: We will understand what causes sound. **Description**: a. The teacher will introduce the phenomena: How can a rubber band cause sound? b. Watch the video: Visualizing vibrations c. Students will engage in a quick turn and talk to develop a list of questions they have about how instruments make sounds d. The teacher will have students share a few questions they have. e. The students will quickly develop a model on a whiteboard of a musical instrument they will build that makes sound (they will edit the model as they learn). f. Possible instruments that students could build g. Provide students with various materials for them to build and create an instrument that vibrates based on their model. The students can adjust their plan while they are carrying out their investigation. h. When the students are done making their instrument, show them the Magic School Bus clip that explains sounds and vibrations. Allow students time to revise their projects based on this new information. i. The teacher will then create or uncover the part of the anchor chart that shows that sound causes vibration (the bell and the ear) j. When finished, they should prepare a few sentences (orally or in writing) explaining how their instrument makes noise (should include a description of vibration). k. Prepare a sound museum for the students to communicate information about how their instrument makes sound. You could possibly invite	Advance Organizer Cooperative Learning Providing Feedback	B/D 21C Collaboration, Communication, Critical Thinking, Creativity

		another classroom in or another cooperative learning structure your class is familiar with. **Materials:** Empty tissue boxes, paper towel rolls, paper plates, oatmeal containers, rubber bands, string, dry beans **Appendix Documents**: ● Visualizing vibrations ● Magic School Bus clip ● Brainpop Jr - engineering and design ● Anchor Chart		
2	**1-PS4-1** **CCC2** (cause and effect) **SEP 1** (asking questions and defining problems) **SEP2** (developing and using models) SEP3 (planning and carrying out investigations)	**3. Title: Planning and Carrying out Investigations** **Objective**: ● Students will plan and carry out an investigation on the cause and effect of sound that can make materials vibrate. ○ Sample Student Friendly Objective: ■ We will understand that sound causes vibration. **Description**: a. The teacher will introduce the phenomena: What makes your throat vibrate when you hum? b. Students will engage in a quick turn and talk to develop a list of questions they have about how it is possible to see or feel sound. c. The teacher will have students share a few questions they have. d. The students will quickly develop a model on a whiteboard of how sounds can make object moves. e. Teacher will give each group of students a bowl, saran wrap, a rubber band, rice/sprinkles, and a sound making object f. Students will cover the bowl tightly with saran wrap and place a few pieces of rice or sprinkles on top of the wrap. g. Students will place the sound making object near the bowl and make a sound. h. Students will observe the rice vibrating on top of the saran wrap. i. The teacher will then create or uncover the part of the anchor chart that shows that vibration can cause sound (the bowl). j. After completing the investigations, students will revisit the original model on their whiteboard. They will make edits based on their new understanding and share out how their model changed. **Materials:** Bowl, saran wrap, rubber band, rice and/or sprinkles, metal pan, spoon, speaker **Appendix Documents**:	Cooperative Learning Generating and Testing Hypothesis	B/D 21C Collaboration, Critical Thinking, Creativity

		Move rice with sound/pan: Move sprinkles with voice: Move rice or sprinkles with sound/speaker: Brainpop Jr - sound Anchor Chart		
2	1-PS4-2 **CCC2** (cause and effect) **SEP1** (asking questions and defining problems) **SEP2** (developing and using models) SEP3 (planning and carrying out investigations)	**4. Title: Constructing Explanations and Designing Solutions** **Objective:** ● Students will construct explanations and design solutions on the cause and effect of objects in darkness being seen when illuminated. ○ Sample Student Friendly Objectives: ■ We will know the meaning of illumination. ■ We will understand that objects in darkness can be seen when they are illuminated. **Description:** a. The teacher will introduce the phenomena: How can we see inside a cave? - you have two video options to show the kids: i. Option 1 - Video Caver ii. Option 2 - Spelunking Video b. Watch the video of a virtual tour of a cave c. Students will engage in a quick turn and talk to develop a list of questions they have about how we can see inside of dark spaces. d. The teacher will have students share a few questions they have. e. The students will quickly develop a model on a whiteboard of how they can see things in darkness. f. The teacher will have prepared a few boxes. In the boxes have a hidden message that students need to illuminate. g. The teacher should also block out the natural light from windows. h. Turn all lights off (making it as dark as you can) i. The students will then need to illuminate the inside of the box (with a flash light or glow stick) to discover the hidden message. j. Once the students have illuminated the boxes. Ask the students how they were able to see the message. What makes it so we can see? k. Then ask the students how they would illuminate the classroom so they can work the rest of the day. Then you can take the paper off the windows and talk about how the sun illuminates the earth or lights inside a building. l. The teacher will then create or uncover the part of the anchor chart that shows illumination (the sun, apple, eye, and the two boxes with the	Advance Organizer Cooperative Learning Generating and Testing Hypothesis	B/D 21C Collaboration, Critical Thinking, Creativity

		apples in it). m. After completing the investigations, students will revisit the original model on their whiteboard. They will make edits based on their new understanding and share out how their model changed. **Materials:** Glow sticks, Flashlights, Boxes, Dark paper **Appendix Documents**: Video Caver Video, Spelunking Video, Brainpop Jr - Light, Anchor Chart		
2	1-PS4-3 **CCC2** (cause and effect) **SEP1** (asking questions and defining problems) **SEP2** (developing and using models) SEP3 (planning and carrying out investigations)	**5. Title: Plan and Carrying out Investigations** **Objective:** ● Students will plan and carry out investigations on the cause and effect of light passing through different materials**.** ○ Sample Student Friendly Objective: ■ We will understand that the amount of light passing through different materials can change. **Description:** a. The teacher will introduce the phenomena: How can we see outside when there are clouds? b. Students will engage in a quick turn and talk to develop a list of questions they have about how we can still see even if it is cloudy/rainy. c. The teacher will have students share a few questions they have. d. The students will quickly develop a model on a whiteboard of how they can see if there are clouds. e. The students will work in pairs. Each group should have a flashlight, a plate with an emoji glued on, a transparent object, a translucent object, a opaque object, and a reflective object, and a Beam of Light Observation Form. f. The students will start by drawing a picture of what they think the emoji picture will look like when they shine a light directly on it. g. After they draw the picture, they will shine the light on the emoji and record what they saw. h. Next, they will draw a picture of what they think the emoji will look like when they place a clear plastic cup (or any transparent object) in front of the emoji. i. The students will then place the cup in front of the emoji picture and shine the light through the cup. They then record how the emoji picture changed. j. Complete steps H and I for the translucent object, opaque objects and reflective objects.	Cooperative Learning Generating and Testing Hypothesis	B/C/D Collaboration, Critical Thinking, Creativity

		k. After the experiment, the teacher will then uncover the part of the anchor chart that shows the path of beams (It is next to the sun) l. After completing the investigations, students will revisit the original model on their whiteboard. They will make edits based on their new understanding and share out how their model changed. **Materials:** Transparent object(s) {clear plastic cup, glass, water, etc.}, Translucent object(s) {some tinted plastic cups, waxed paper, sunglasses, etc.}, Opaque object(s) {some plastic cups, aluminum foil, cardboard, etc.}, Reflective object (small mirrors), Flashlight Plastic plate with an emoji glued to the back of it (optional) **Appendix Documents**: Beam of Light Observation Form Anchor Chart		
2	1-PS4-4 **SEP 6** (construct explanations and design solutions)	**6. Title:** Constructing Explanations and Designing Solutions **Objective:** ● Students will construct an explanation and design a solution to the problem of communicating over distance by designing and building a device that uses light to communicate. ○ Sample Student Friendly Objective: ■ We will be able to create a code using light to communicate with our partner. **Description:** a. Ask students, "How do we communicate with people who are far away?" Brainstorm some ideas as a class on how we communicate and share out (Facetime, telephone, email, etc.). b. Students will engage in a quick turn and talk to develop a list of questions they have about how we can communicate with others even when they are far away. The teacher will have students share a few questions they have. c. Start the Mystery Science lesson, "How could you send a secret message to someone far away?" d. Follow the Mystery Science lesson slides. Below are some of the discussion questions and points: i. Do you think there is a way to communicate YES or NO using only light? Have students turn and talk to share with a partner. Share the partnership's ideas aloud as a class. ii. Talk about how you could make a code using a flashlight (flash once means yes, flash twice means no). Compare it to a traffic light, which communicates to us when we are driving.	Cooperative Learning Cooperative Learning	B/D 21C Collaboration, Communication, Critical Thinking, Creativity

		e. At the end of the lesson, pose this question to the students: How do emergency responders use light and/or sound to communicate? Students could turn and talk to a partner, discuss as a class, draw a model, etc. to share out their new learning. f. Create or uncover and discuss the communication and engineering portion of the anchor chart. **Materials:** Flashlights **Appendix Documents**: Mystery Science Lesson, Mystery Science- Color Codes, Anchor Chart	Similarities and Differences Cooperative Learning	
2	1-PS4-1 CCC2 (cause and effect) SEP 1 (asking questions and defining problems) SEP 2 (developing and using models)	**7. Title: Developing a Model (Post-Assessment)** **Objectives:** ● Students will ask questions about the cause and effect of vibrating materials and sounds ● Students will develop a model about the cause and effect of vibrating materials and sound. ○ Sample Student Friendly Objective: ■ We will be able to develop a model that explains how the glass breaks.	Critical Thinking Cooperative Learning	A/C 21C Collaboration, Critical Thinking, Creativity

Unit 2 (Light and Sound): Resources

UNIT RESOURCES
Teacher Resources: ● Mystery Science ● Wonder of Science website ● STEM-Gauge-K-2-Life-Science ● See Appendix Documents under each lesson

Student Resources:

- Dry/erase boards
- Dry/erase markers
- Brain Pop Jr. (Engineering, Lights, and Sound)
- See Appendix Documents under each lesson

Vocabulary:

light - energy that travels in straight line
illuminate - to light up
reflection - the bouncing back of light
transparent - all light goes through
translucent - some light goes through, may be blurred
opaque - light is blocked, light goes through
vibrate - a fast back and forth movement
sound - energy made by vibrations
sound wave - a vibrating energy that looks like a wave and transmits sound

Unit 3: Structure and Function

Content Area: Science	Course: First Grade	UNIT: Structure and Function

Unit Description:	Unit Timeline:
During the study of structure and function students will explore how people learn from animals and plants to help solve human problems. These lessons focus on engineering based on learning about the different structures and functions of animals and plants. Students are expected to develop understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs as well as how behaviors of parents and offspring help the offspring survive. The understanding is developed that young plants and animals are like, but not exactly the same as, their parents. Students will discover phenomena involving plants and animals, create models, and conduct engineering experiments. **Anchor Chart**	4-5 weeks (30 minutes per day)

DESIRED Results

Transfer Goal - ***Students will be able to independently use their learning to……***

1. **Ask questions and define problems**: Define a simple problem that can be solved through the development of a new or improved object or tool. Ask questions based on observations to find more information about the natural and/or designed world(s). Ask and/or identify questions that can be answered by an investigation.
2. **Develop and use models**: Compare models to identify common features and differences. Develop a simple model based on evidence to represent a proposed object or tool. Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).
6. **Construct explanations and design solutions**: Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. Use materials to design a device that solves a specific problem or a solution to a specific problem.
8. **Obtain, evaluate, and communicate information**: Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.

Understandings – *Students will understand that… (Big Ideas)*

1. (Patterns) Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.
6. (Structure & Function) The shape and stability of structures of natural and designed objects are related to their functions.

Essential Questions: ***Students will keep considering…***

- How do animal parts relate to their function?
- How do plant parts relate to their function?
- How do patterns in behavior of parents and offspring help a species survive?
- How are young plants and animals similar to their parents?
- How are young animals and plants different from their parents?
- How can people solve problems by mimicking structures and functions from plants/animals?

STANDARDS ADDRESSED

Highlighted standards are included **multiple times** in the sample activities in this unit. Standards addressed only once in the sample activities will need to be addressed through additional activities in the classroom.

Students who demonstrate understanding can:

1-LS1-1/MO 1.LS1.A.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.* [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.]

1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. [Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).]

1-LS3-1/MO 1.LS3.A.1: Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. [Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.] [Assessment Boundary: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.]

Disciplinary Core Ideas **Students will know...**	**Cross Cutting Concepts** **Students will understand…**	**Science and Engineering Practice** **Students will be able to...**
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.D: Information Processing Animals have body parts that capture and convey different kinds of	**CCC6: Structure and Function** ● The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested. ● Define a simple problem that can be solved through the development of a new or improved object or tool. **SEP2: Developing and Using Models** Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. ● Compare models to identify common features and differences. ● Develop a simple model based on evidence to

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) LS3.A: Inheritance of Traits Young animals are very much, but not exactly, like their parents. Plants also are very much, but not exactly, like their parents. (1-LS1-1)		represent a proposed object or tool. **SEP6: 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. ● Use materials to design a device that solves a specific problem or a solution to a specific problem. (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 in behaviors that help the offspring to survive. (1-LS1-2)	**CCC1: Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested. ● Ask questions based on observations to find more information about the natural and/or designed world(s). **SEP2: Developing and Using Models** Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. ● Compare models to identify common features and differences. SEP8: 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)
LS3.B: Variation of Traits Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (1-LS3-1)	**CCC1: Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS3-1)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested. ● Ask questions based on observations to find more

		information about the natural and/or designed world(s). ● Ask and/or identify questions that can be answered by an investigation. **SEP2: Developing and Using Models** Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. ● Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s). **SEP6: 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-LS3-1)

Unit 3 (Structure and Function): Assessment

EVIDENCE of LEARNING			
Understanding 6	Standards **1-LS1-1** **CCC6** (structure and function) **SEP6** (constructing explanations and designing solutions)	**Unit Performance Assessment**: Structures and Functions Assessment **Scoring Guide:** *Included in Assessment document*	**R/R Quadrant 21 Century** B/D Communication, Critical Thinking, Creativity

Unit 3 (Structure and Function): Sample Activities

SAMPLE LEARNING PLAN
Pre-assessment: *Look at the pictures of plants and animals. Draw a model. Write questions you have.*
Anchoring Phenomena for this Unit: Phenomena Listed in this Unit: ● Assessment Picture ● How do baby animals survive? ● Animal Pictures ● Bean Plant ● Gecko Video Other Possible Phenomena: ● Ear ● Shape shifting octopus ● Helicopter seeds ● Variation in offspring

- Why do zebras have stripes?
- Time Lapse of plant growing
- Hermit crabs
- Parental care
- Shade seeking plants climbing trees
- Turtle hiding
- Sunflower seeds
- Acorn shape
- Camouflage
- Tadpole to frog (environment survival)

This curriculum is based on the Next Generation Science Standards. For clarification on the standards, please visit the Wonder of Science website. Go to the standards tab to find your grade level and unit. After clicking on the unit, you will see a list of standards students should learn that you can click. After clicking on the standard then the evidence link, you will find a clarification statement as well as the practices you should take the standard through. Also included are observable features of student performance by the end of the grade that will help indicate whether or not the student has met the standard.

Many of the sample activities in this unit have *Asking and Answering Questions* and *Developing a Model* in addition to the other scientific practices found in the evidence section. We added these two practices to use as a pre-assessment and to see what the students already know and understand about the standard to guide our instruction. Some, but not all, objectives are outlined in the samples; it will be up to you to look at the objectives that are not addressed in this document and make plans accordingly.

Understanding	Standards	Major Learning Activities:	Instructional Strategy:	R/R Quadrant: 21C:
2	**1-LS1-1** **CCC6** (structure and function) **SEP1** (asking questions and defining problems)	**1. Title: Asking Questions** **Objectives**: ● Students will ask questions about how we can use the structure and function of plant and animal external parts to design a solution to a human problem. ● Sample Student Friendly Objective: ■ We will be able to ask questions about plant and animal structures. **Description**: a. The teacher will introduce the unit's anchoring phenomena by showing the picture on the pre-assessment b. Have the students watch and begin thinking about questions they have about how they can solve a human problem with the structure and function of the sample animals. (This may be difficult for the pre-assessment and that is okay!). c. The teacher will keep the picture posted while students compile at least 2		B/D 21C communication, collaboration, critical thinking, creativity

		questions *Follow the Pre-Assessment Protocol **OR** this Alternate Questioning Activity:* A. In small groups, with one person as recorder, ask students to write down questions they have about what they observed. (5 minutes) Rules for Producing Questions: a. Ask as many questions as you can. b. Do not stop to discuss, judge or answer the questions. c. Write down every question exactly as it is stated. d. Change any statement into a question. B. Categorize Your Questions (5 minutes) In your list, you might have the two types of questions previously mentioned: closed-ended and open-ended. Here are working definitions for closed and open-ended questions: Closed-ended questions can be answered with "yes" or "no" or with one word. Open-ended questions require an explanation and cannot be answered with "yes" or "no" or with one word. Review your list of questions and identify closed and open-ended questions. Mark the open-ended questions with an O and the closed-ended questions with a C. THEN, change questions from one type to another. Go back to your list of questions and change one closed-ended question into an open-ended, and change one open-ended question into a closed-ended one. Make the changes right on the list. C. Choose the three most important questions from your list. Mark them with an "X" and discuss your reasons for selecting those three. **Appendix Documents**: Pre/Post Assessment Protocol Pre-Test Model Assessment Picture	Advance Organizer	
2	**1-LS1-1** **CCC6** (structure and function) **SEP2** (developing and using models) **SEP6**	**2. Title: Developing a Model and Constructing Explanations** **Objectives**: ● Students will develop a model using the structure and function of plant and animal external parts to design a solution to a human problem. ● Students will construct an explanation about how we can use the structure and function of plant and animal external parts to design a solution to a human problem. ○ Sample Student Friendly Objective: ■ We will be able to design a solution to a human problem using plant and animal structures. **Description**: a. The teacher will introduce the unit's anchoring phenomena by showing the	Advance	B/D 21C communication, collaboration, critical thinking, creativity

	(constructing explanations)	picture on the pre-assessment b. Have the students watch and begin thinking about questions they have about how they can solve a human problem with the structure and function of the sample animals. (This may be difficult for the pre-assessment and that is okay!). c. The teacher will keep the picture posted while students compile at least 2 questions (Follow the Pre-Assessment Protocol) d. When the students are done writing at least two questions, they will turn their paper over and begin to develop a model by drawing a picture of how the anchoring phenomena works. e. Once the students are done with the pre-assessment, have them turn and talk with a partner about their model. f. Next, the teacher will have students share their questions with the class. g. The teacher will develop a classroom anchor chart with a list of questions that the students have about the phenomena. **Appendix Documents**: Pre/Post Assessment Protocol Pre-Test Model Assessment Picture	Organizer	
1	1-LS1-2 **CCC1** (patterns) SEP8 (obtaining, evaluating, and communicating information)	**3. Title: Obtaining, Evaluating, and Communicating Information** **Objective**: ● Students will obtain, evaluate, and communicate the patterns in behavior of parents and offspring that help the offspring survive. ○ Sample Student Friendly Objective: ■ We will understand that parents help their offspring survive. ■ We will understand that parents respond to their offspring's signals. **Description**: a. Pose the question, "How do you think baby animals survive?" Have students turn and talk with a partner. Share out a few responses. b. Tell the students that today we will learn how parents can help their offspring survive. c. Open the Mystery Science read aloud lesson called, "Why do baby ducks follow their mother?" d. Follow the Mystery Science lesson slides. Stop and discuss when the book poses a question. Have students turn and talk to discuss their thinking, and share out in a class discussion. e. Following the Mystery Science lesson, discuss different scenarios when other animal parents help their offspring survive. The teacher could show videos,	Cooperative Learning Setting Objectives Cooperative	A/C 21C communication, collaboration, critical thinking, creativity

		pictures, or describe scenarios. (Some examples could include: when a baby cries, a mother feeds it; when danger is present, parents protect offspring; some young animals become silent to avoid predators). f. Have students draw a model of parents helping their offspring survive. Students can share and explain their drawing with a partner, publish their picture with a voice recording on SeeSaw, participate in a gallery walk, etc. to share their new learning. g. Teacher will uncover the nest, mother, and baby birds on the anchor chart. **Appendix Documents**: Mystery Science Lesson Anchor Chart	Learning Cooperative Learning	
1	1-LS3-1 **CCC1** (patterns) **SEP6** (constructing explanations and designing solutions)	**4. Title**: **Obtaining, Evaluating, and Communicating Information** **Objective**: ● Students will obtain, evaluate, and communicate the patterns in how young plants/animals are like but not exactly alike their parents. ○ Sample Student Friendly Objective: ■ We will understand that young plants and animals are similar to their parents. **Description**: a. The teacher will pose the following question: What similarities and differences do you notice about animal parents and their young? Animal Pictures What do you notice about young plants and their parents? Bean Plant (Click on the picture) b. Students will make a T chart recording both similarities and differences. c. Students will share out. d. The teacher will introduce the book called *Big Ears* on Mystery Science. Mystery Science Book (click on *Start Mystery*) e. The students will listen to the book. (Discussion stopping points embedded within the text.) f. After the book, students will participate in completing the matching activity with a partner. Matching Activity (click on *Get Activity Supplies*) and Pictures g. Teacher will create or uncover the part of the anchor chart showing a mature plant and young plant (upper right). Refer back to the nest, mother, and baby birds as well. **Appendix Documents**: Mystery Science Book Anchor Chart	Similarities and Differences Cooperative Learning	A/C Collaboration, Critical Thinking

1	**1-LS1-1** **CCC6** (structure and function) **SEP1** (asking questions and defining problems)	**5. Title**: **Ask Questions** **Objectives:** ● Students will ask questions about how we can use the structure and function of plant and animal external parts to design a solution to a human problem. ● Sample Student Friendly Objective: ■ We will be able to ask questions about the external parts of plants and animals. **Description**: a. The teacher will discuss with students that people look for ways to make objects that can help us in our daily lives. b. Watch the Gecko Video as an example of an animal structure humans might use to solve a problem. c. In small groups, with one person as recorder, ask students to write down questions they have about what they observed. (5 minutes) Rules for Producing Questions: i. Ask as many questions as you can. ii. Do not stop to discuss, judge or answer the questions. iii. Write down every question exactly as it is stated. iv. Change any statement into a question. d. Categorize Your Questions (5 minutes) In your list, you might have the two types of questions previously mentioned: closed-ended and open-ended. Here are working definitions for closed and open-ended questions: Closed-ended questions can be answered with “yes” or “no” or with one word. Open-ended questions require an explanation and cannot be answered with “yes” or “no” or with one word. Review your list of questions and identify closed and open-ended questions. Mark the open-ended questions with an O and the closed-ended questions with a C. THEN, change questions from one type to another. Go back to your list of questions and change one closed-ended question into an open-ended, and change one open-ended question into a closed-ended one. Make the changes right on the list. e. Choose the three most important questions from your list. Mark them with an “X” and discuss your reasons for selecting those three. Optional Activity: 1. The students will play a matching game (pg. 63-64) with the structure and function of an animal or plant with an example of how people use that structure and function daily. 2. The teacher will refer back to the phenomenon and pose the following problems: i. I need to protect a part of my body	Advance Organizer	B/D Communication, Collaboration, Critical Thinking, Creativity

		ii. I need to reach/pick something up iii. I need to stay dry iv. Or another problem they can think of **Materials:** Chart paper **Appendix Documents**: Matching game (one game per partner) (page 63-64)		
1	**1-LS1-1** **CCC6** (structure and function) **SEP2** (developing and using models)	**6. Title**: **Develop a Model** **Objectives:** ● Students will develop a model using the structure and function of plant and animal external parts to design a solution to a human problem. ○ Sample Student Friendly Objective: ■ We will be able to use plant and animal external parts to design a solution to meet human needs **Description**: f. The teacher will refer back to the phenomenon and pose the following problems: i. I need to protect a part of my body ii. I need to reach/pick something up iii. I need to stay dry iv. Or another problem they can think of g. The students will quickly develop a model that includes the plant or animal they have chosen. Next, they model should show how the solution based on the structure and function of the animal they have chosen h. Now, the students will have the opportunity to create the object from their model to meet human needs. i. The students will have approximately 30 minutes to design their model from available materials. ii. Students should adjust their model as they go **Materials:** paper Scissors Glue Pencil/crayons Various materials to create a model **Appendix Documents**: Measured Progress Stem Gauge Lesson (Page 50-64)	Advance Organizer	B/D Communication, Collaboration, Critical Thinking, Creativity

1	**1-LS1-1** **CCC6** (structure and function) **SEP6** (constructing explanations and designing solutions)	**7. Title: Construct an Explanation** **Objectives:** ● Students will construct an explanation about how we can use the structure and function of plant and animal external parts to design a solution to a human problem. ● Sample Student Friendly Objective: ■ We will be able to use plant and animal external parts to design a solution to meet human needs **Description**: a. Students should prepare to share their models with the class. b. As students partner or group up with one another, they should: i. describe how their design solves a human problem. ii. describe the object and the purpose of its design. iii. describe the animal/plant part that inspired their design. c. Teacher will uncover the rest of the anchor chart to reveal structure and function as well as the engineering section at the bottom of the chart. **Materials:** Student models **Appendix Documents**: Measured Progress Stem Gauge Lesson (Page 50-64) Anchor Chart	Advance Organizer	B/D Communication, Collaboration, Critical Thinking, Creativity
2	**1-LS1-1** **CCC6** (structure and function) **SEP1** (asking questions and defining problems) **SEP2** (developing and using models) SEP3 (planning and carrying out investigations)	**8. Title: Developing a Model (Post-Assessment)** **Objectives**: ● Students will construct an explanation about how we can use the structure and function of plant and animal external parts to design a solution to a human problem. ● Students will ask questions about how we can use the structure and function of plant and animal external parts to design a solution to a human problem. ● Students will develop a model using the structure and function of plant and animal external parts to design a solution to a human problem. ○ Sample Student Friendly Objective: ■ We will be able to design a solution to a human problem using plant and animal structures.	Advance Organizer	B/D Communication, Collaboration, Critical thinking, Creativity

UNIT RESOURCES
Teacher Resources: ● Mystery Science ● Wonder of Science website ● STEM-Gauge-K-2-Life-Science ● See Appendix Documents under each lesson ● Additional books to consider: ○ *From Bird Poop to Wind: How Seeds Get Around* by Ellen Lawrence ○ *From Seed to Plant* by Gail Gibbons ○ *How a Seed Grows* by Helene Jordan ○ *About Reptiles* ○ *About Insects* ○ *About Mammals* ○ *Fishes (True Books: Animals)* by Melissa Stewart
Student Resources: ● Dry/erase boards ● Dry/erase markers ● Brain Pop Jr. ● See Appendix Documents under each lesson
Vocabulary: structure - the way something is made; parts arranged together in certain way function - what something is used for; serves a purpose or role parent - caregiver of the offspring; mother or father offspring - the young/child of a person, animal, or plant