

# STAGE 1 – DESIRED RESULTS

**Unit Title: Waves and Their Applications in Technologies for Information Transfer**

**Grade Level: First**

**Length/Timing of Unit:**

**Teacher(s)/Designer(s): Pascack Valley Regional Science Committee**

**Science State standards addressed (verbatim):**

**Students who demonstrate understanding can:**

- 1-PS4-1. 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 in darkness 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 investigations 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. 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.]

**Connections to Common Core Standards (verbatim):**

**ELA/Literacy**

W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. (1-PS4-2)

W.1.7 Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given

topic and use them to write a sequence of instructions). (1-PS4-1),(1-PS4-2),(1-PS4-3),(1-PS4-4)

W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-PS4-1),(1-PS4-2),(1-PS4-3)

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)

### **Mathematics**

MP.5 Use appropriate tools strategically. (1-PS4-4)

1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object. (1-PS4-4)

1.MD.A.2 Express the length of an object as a whole number of length units, by layering 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. Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps. (1-PS4-4)

**Essential Questions** (3-4) in provocative, student-friendly language:

- EQ1. How are sound and vibration related?
- EQ2. How does light help us see objects better?
- EQ3. How does light interact with different materials?
- EQ4. How can light and sound be used for communication?

**Big Ideas/ Enduring Understandings: *Students will understand that...***

EQ1:

- The vibrations of different objects produce different sounds.
- Sound can create vibrations

EQ2:

- Light needs to be present in order for an object to be seen

EQ3:

- The type of material an object is made out of affects what happens when light is shone on it.

EQ4:

- People use a variety of devices that utilize light and sound to communicate over long distances.

**A list of factual knowledge to be taught – *Students will know...***

EQ1:

- Key vocabulary such as: vibration, sound
- Sound creates vibrations.
- Vibration creates sounds.

EQ2:

- Key vocabulary such as: light, darkness

EQ3:

- Key vocabulary such as: opaque, transparent, translucent, reflective

- Mirrors can be used to redirect a light beam.
- Different materials are used for different purposes

EQ4:

- Light and sound can travel
- Light and sound can be used to communicate over distances by telephones, warning signals, runway lights etc.
- Key vocabulary such as: communication

**A list of skills to be taught or reinforced (including habits of mind) – *Students will be able to...***

EQ1:

- Observe the vibrations caused by sound (i.e.: paper next to a speaker, etc.)
- Observe sounds causing vibration (i.e.: tuning fork, guitar string)
- Design an object that produces sound

EQ2:

- Compare and contrast what can be seen in light and in darkness

EQ3:

- Compare and contrast how light affects different objects.
- Plan and conduct investigations to answer a question such as how light affects different objects

EQ4:

- Design a “device” or way to communicate over a distance using sound or light. (ie. across the room)

## STAGE 2 – ASSESSMENT EVIDENCE

**Assessments** (Quizzes, tests, and a performance task to assess student mastery formatively and summatively, including an exemplar of proficient student work and a scoring guide for the performance task):

**Assessment for: PS4-2, PS4-4:**

**Goal:** Your goal is to send a message using light and/or sound

**Role:** You are a first grader.

**Audience:** The audience is the leader of your group.

**Situation:** You are on a camping trip in the woods and have become separated from the group at night. You need to send a signal to the leader of your group so that they can find you. You can use anything that you brought with you on your camping trip. You will need to use light, sound, or both to communicate your message.

**Product/Performance and Purpose:** You need to draw a picture showing what you would do to help the leader find you. Be as creative as you can! You should use vocabulary words from the word bank provided to label your drawing. (words provided: light, shadow, darkness, sound, transparent, opaque, translucent, reflective, vibrations) Be prepared to defend your solution, using evidence such as what the woods were like before your proposed solution, i.e. We could not be found because we couldn't be seen in the darkness

without any light.

**Standards & Criteria for Success:** Your drawing needs to include:

\*vocabulary words from the word bank provided to label your illustration  
(more words included correctly would signify greater understanding)

**PS4-1:**

Journal notes from lab stations experimenting with sound and vibration can be used as an informal assessment. Possible website to use as a reference:

<http://www.discoveryeducation.com/teachers/free-lesson-plans/the-phenomenon-of-sound-waves.cfm>

**PS4-3:**

Project in lesson 8 of Waves: Light and Sound unit (found in Stage 3) can be used to assess understanding

## STAGE 3 – Sample LEARNING PLAN

**Summary of Learning Activities** (Lectures, mini-lessons, read alouds, independent reading, films, website exploration, discussions, dialogues, debates, partner or small-group work, student presentations, reports, journals, reflections, in-class assessments, written reports, essays, research, and homework):

\*Activity with lab stations to experiment with sounds/vibrations:

<http://www.discoveryeducation.com/teachers/free-lesson-plans/the-phenomenon-of-sound-waves.cfm>

(Activity can be used as an assessment for performance expectation PS4-1).

\*website with resources for sound and light: [www.pbslearningmedia.org](http://www.pbslearningmedia.org)

\*unit on Waves: Light and Sound, pdf created by Sue Bishop, Erika Olvey and Annie Grammer (use google)

This unit includes activities, resources, handouts, and projects covering topics such as going on a listening walk, making an instrument using vibrations, and creating a project demonstrating transparent, translucent, and opaque

**\*Suggested Books:**

- *The Listening Walk* by Paul Showers
- *All About Sound* by Lisa Trumbauer
- *All About Light* by Lisa Trumbauer
- *Nothing Sticks Like a Shadow* by Ann Tompert
- *Flashlight* by Lizi Boyd
- *Zin! Zin! Zin! A Violin* by Lloyd Moss
- *What Makes a Shadow?* by Clyde Robert Bulla

**\*Suggested Videos:**

\*The Magic School Bus: In the Haunted House - Sound is Vibration: The class learns about sound as it prepares for a concert at the Sound Museum and then takes a side trip to a mysterious house full of

strange sounds. ([www.youtube.com](http://www.youtube.com), also available on Safari Montage)

# STAGE 1 – DESIRED RESULTS

**Unit Title: From Molecules to Organisms: Structures and Processes**

**Grade Level: First**

**Length/Timing of Unit:**

**Teacher(s)/Designer(s): Pascack Valley Regional Science Committee**

**Science State standards addressed (verbatim):**

**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.** [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).]

**Connections to Common Core Standards (verbatim):**

**ELA/Literacy**

RI.1.1: Ask and answer questions about key details in a text. (1-LS1-2)

RI.1.2: Identify the main topic and retell key details of a text. (1-LS1-2)

RI.1.10: With prompting and support, read informational texts appropriately complex for grade. (1-LS1-2)

W.1.7: Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions). (1-LS1-1)

**Mathematics**

1.NBT.B.3 Compare two two-digit numbers based on the meanings of the tens and one digits, recording the results of comparisons with the symbols  $>$ ,  $=$ , and  $<$ . (1-LS1-2)

1.NBT.C.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a

two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. (1-LS1-2)

1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. (1-LS1-2)

1.NBT.C.6 Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. (1-LS1-2)

**Essential Questions** (3-4) in provocative, student-friendly language:

- EQ1. How do animals' physical characteristics help them survive, grow and meet their needs in their environment?
- EQ2. How do plants' physical characteristics help them survive, grow and meet their needs in their environment?
- EQ3: How can humans learn from the way plants and animals protect themselves and survive in their environment?
- EQ4. How do adult animals care for their young to insure their survival?

**Big Ideas/ Enduring Understandings: *Students will understand that...***

EQ1.

- 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.

EQ2.

- Plants have different parts that help them survive and grow.
- The environment has an effect on the adaptations and survival of plants

EQ3.

- Humans can mimic characteristics of plants and animals to solve problems

EQ4.

- In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.

**A list of factual knowledge to be taught – *Students will know...***

EQ1:

- Animals have body parts that gather information about their environment.
- Animals respond to this information with behaviors that help them survive.
- Key vocabulary such as: adaptation, environment, survival, behavior

EQ2:

- Parts of a plant and their function
- Characteristics of each season that affect plant life
- Key vocabulary such as: roots, stems, leaves, flowers, fruits

EQ3:

- Examples of characteristics of plants/animals that humans have learned from and mimicked for protection and survival (water runs off a raincoat much like water runs off a duck's feathers, barbed wire is used to keep out unwanted guests much like the thorns on a rose stem)

EQ4:

- Various survival skills that parent animals teach their young, such as finding food, avoiding and protecting themselves from predators, creating and finding shelter, etc.

**A list of skills to be taught or reinforced (including habits of mind) – *Students will be able to...***

EQ1:

- Examine diagrams of various animals and identify specific parts and their functions (i.e. turtle shells for protection, elephant trunks for communication, etc.)
- Compare animal and plant survival techniques in a Venn Diagram

EQ2:

- Examine diagrams of various plants and identify specific parts and their functions
- Describe and explain what would happen to a plant if one of the plant's parts was broken or missing (i.e. without leaves, the plant would be unable to make food, etc.)

EQ3:

- Compare and contrast animal, plant, and human characteristics for similar functions
- Make connections between animal/plant characteristics and solutions to human problems

EQ4:

- Explain the connections between various animals that care for their young in similar ways

## STAGE 2 – SAMPLE ASSESSMENT

**Assessments** (Quizzes, tests, and a performance task to assess student mastery formatively and summatively, including an exemplar of proficient student work and a scoring guide for the performance task):

**1-LS1-1.**

**Goal:** Your goal is to analyze and identify external characteristics of animals and plants that help them naturally survive and protect themselves in order to create a protective outfit and a shelter for you during a game of hide and seek.

**Role:** You are a first grader.

**Audience:** Other first graders

**Situation:** You and your friends are playing Ultimate Hide and Seek in a wooded area by your home. You need to design what you will wear to play, as well as a base that will protect you from other players. You do

not want to be seen, and you do not want others to be able to enter your base. Think about the animals that you have learned about and the external traits that help protect them from predators. (Provide photographs of animals discussed throughout the unit for students to use as a resource)

**Product/Performance and Purpose:** Illustrate your designs for clothing and your base. Label your drawings indicating which animals inspired each part of your idea. (i.e. If your jacket will be white because it is winter time, you were inspired by the Arctic Fox, etc.)

**Standards & Criteria for Success:** Your drawing needs to include: labels indicating the animal inspiration; sentences to explain your decisions. Be prepared to be able to defend your choices based on what you have learned in this unit.

**1-LS1-2.**

To assess this performance standard, students can read the following passages. Student can then use the passages to determine patterns in behaviors of the parents and offspring.

[http://www.readworks.org/sites/default/files/passages/260\\_a\\_baby\\_polar\\_bear\\_grows\\_up.pdf](http://www.readworks.org/sites/default/files/passages/260_a_baby_polar_bear_grows_up.pdf)

[http://www.readworks.org/sites/default/files/passages/390\\_all\\_about\\_koalas\\_0.pdf](http://www.readworks.org/sites/default/files/passages/390_all_about_koalas_0.pdf)

<http://www.readworks.org/passages/elephants-excellent-trunk>

## STAGE 3 – SAMPLE LEARNING PLAN

**Summary of Learning Activities** (Lectures, mini-lessons, read alouds, independent reading, films, website exploration, discussions, dialogues, debates, partner or small-group work, student presentations, reports, journals, reflections, in-class assessments, written reports, essays, research, and homework):

**\*Suggested Books:**

*The Magic School Bus Hops Home: A Book About Animal Habitats* by Pat Relf

*What if You Had Animal Teeth?* by Sandra Markle

*What Do You Do With a Tail Like This?* by Steve Jenkins & Robin Page

*Mystery Mouths* by Jacqueline Barber

*Penguins* by Gail Gibbons

*101 Animal Babies Book* by Melvin and Gilda Berger

*Are You My Mother?* by P.D Eastman

\*A collection of non fiction books with teaching guides:

[www.lernerbooks.com/sitecollectiondocuments/teachingguides/9780761366812.pdf](http://www.lernerbooks.com/sitecollectiondocuments/teachingguides/9780761366812.pdf)

**\*Suggested Videos:**

\*Henry the Lizard Amazing Animals: Animal Changes: Join Henry the Lizard as he explores extraordinary wildlife, crazy characters and unexpected animal surprises. Investigate some incredible animal changes from a caterpillar disguising itself as an ant to a bird that changes its bill to match its food supply. As seen on The Disney Channel. Based on "The Really Amazing Animal Book." ([www.youtube.com](http://www.youtube.com), also found on Safari Montage)

\*Henry the Lizard Amazing Animals: Animal Weapons: Join Henry the Lizard as he explores some extraordinary wildlife, crazy characters and unexpected animal surprises. Don't touch that animal! This program explores the defense mechanisms of the animal kingdom. The spiky porcupine and acid-squirting termite are just a couple of the heavily fortified animals featured. As seen on The Disney Channel. Based on "The Really Amazing Animal Book." ([www.youtube.com](http://www.youtube.com), also found on Safari Montage)

\*Video comparing and contrasting different animal families (parent and baby) Animal Babies - (Animal Atlas) <https://m.youtube.com/watch?v=7nL8WORZY4>

**\*Additional Resources:**

\*Unit on animal adaptations with detailed facts and information, plus student activities and resources: <https://brucemuseum.org/files/AnimalAdaptations2008EG.pdf>

\*Center activities to explore animal adaptations:  
<http://a2ndgradeadventure.blogspot.com/search/label/animal%20adaptations>

Online games to play:  
[www.harcourtschool.com/menus/science/grade1\\_nl.html](http://www.harcourtschool.com/menus/science/grade1_nl.html)

# STAGE 1 – DESIRED RESULTS

**Unit Title: Heredity: Inheritance and Variation of Traits**

**Grade Level: 1**

**Length/Timing of Unit:**

**Teacher(s)/Designer(s): Pascack Valley Regional Science Committee**

**Science State standards addressed** (verbatim):

**1-LS3-1: 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.*]

**Connections to Common Core Standards** (verbatim):

## ELA/Literacy

RI.1.1 Ask and answer questions about key details in a text.

W.1.7 Participate in shared research and writing projects (e.t., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions). (1-LS3-1)

W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question (1-LS3-1)

## Mathematics

MP.2 Reason abstractly and quantitatively. (1-LS3-1)

MP.5 Use appropriate tools strategically. (1-LS3-1)

1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object. (1-LS3-1)

**Essential Questions** (3-4) in provocative, student-friendly language:

- EQ1. How are adult and young plants alike? How are they different?
- EQ2. How are adult and young animals alike? How are they different?

- EQ3. How can individuals of the same kind of plant or animal be different? How can they be the same?

**Big Ideas/ Enduring Understandings: *Students will understand that...***

- EQ1: Young plants are very much, but not exactly like, their parents.
- EQ2: Young animals are very much, but not exactly like, their parents.
- EQ3: Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.

**A list of factual knowledge to be taught – *Students will know...***

EQ1:

- Adult plants can differ from their young by size, shape, color and function
- Basic parts of a plant and their function
- Key vocabulary: measurement, longer, shorter, bigger, smaller, shape

EQ2:

- Adult animals can differ from their young in size, color, markings, ability, food they eat
- Basic characteristics of different animals such as habitat, survival skills, adaptations, etc.
- Key vocabulary: appearance, size, adaptation

EQ3:

- All members of a specific species of plant or animal are not identical
- Certain characteristics of a species can be different, and others can not
- Key vocabulary: species, characteristics

**A list of skills to be taught or reinforced (including habits of mind) – *Students will be able to...***

EQ1/2:

- Use a Venn Diagram to compare and contrast adult and young animals/plants.
- Observe and describe changes plants and animals go through as they mature.
- Explain the connections between the way that both plants and animals grow and change.

EQ3:

- Compare and contrast the similarities and differences in animals and plants of the same family/species

## STAGE 2 – SAMPLE ASSESSMENT

**1-LS3-1**

**Goal:** Your goal is to convince your “parent” that you are their “child” by observing and constructing evidence through observations of common characteristics, similarities and differences.

**Role:** You are a young plant or animal.

**Audience:** A group of parents, including your parent

**Situation:** You are a young plant or animal (you choose!) playing a mystery game with your parent. Your parent cannot see you, and you need to convince them that you are their child. If you present a strong argument to your parent, they will be able to pick you out of the group as their child and you will win the game!

**Product/Performance and Purpose:** Construct a written argument convincing your parent that you are their child. You will read your piece aloud to the group.

**Standards & Criteria for Success:** Your writing piece should include the following:

- a physical description of yourself
- similarities between you and your parent (I have...just like you!)
- examples of things that are different between you and your parent (opposing view; some people may say that I can't be your child because I don't have... They don't realize that I do have...)
- a supporting illustration that shows the similarities and differences between you and your parent

## STAGE 3 – LEARNING PLAN

**Summary of Learning Activities** (Lectures, mini-lessons, read alouds, independent reading, films, website exploration, discussions, dialogues, debates, partner or small-group work, student presentations, reports, journals, reflections, in-class assessments, written reports, essays, research, and homework):

**Suggested Books:**

- *Are You My Mother?* by P.D. Eastman
- *Is Your Mama a Llama?* by Deborah Guarino
- *Baby Animals* by Seymour Simon
- *Does a Kangaroo Have a Mother too?* by Eric Carle

**Suggested Videos:**

\*video of a bean plant growing (time lapse) <http://www.youtube.com/watch?v=EKx4ZwoJqXY>

\*video of mother and baby animals (to use as an introduction)

<http://www.youtube.com/watch?v=j7hkwjCf8>

**Possible activities/Learning experiences:**

- Lesson plan on animal traits using the book, *Does a Kangaroo Have a Mother Too?* Projects include activities using the art style of Eric Carle. <http://www.scholastic.com/teachers/lesson-plan/does-kangaroo-have-mother-too>
- Unit on animal trait inheritance and variation. Includes first grade level texts for students to read, activities, lesson ideas and vocabulary. <http://www.harmonydc.org/Curriculum/pdf/1sample.pdf>

- Lead an investigation involving different plant seeds so that students can begin to connect unique seeds with the development of unique plants.

# STAGE 1 – DESIRED RESULTS

**Unit Title: Earth’s Place in the Universe**

**Grade Level: 1**

**Length/Timing of Unit:**

**Teacher(s)/Designer(s): Pascack Valley Regional Science Committee**

**Science State standards addressed (verbatim):**

**1-ESS1-1 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 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 of time of daylight.]

**Connections to Common Core Standards (verbatim):**

## **ELA/Literacy**

W.1.7 Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions). (1-ESS1-1), (1-ESS1-2)

W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question (1-ESS1-1), (1-ESS1-2)

## **Mathematics**

MP.2 Reason abstractly and quantitatively. (1-ESS1-2)

MP.4 Model with mathematics. (1-ESS1-2)

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

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 to represent the problem.

1.MD.C.4 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. (1-ESS1-2)

**Essential Questions** (3-4) in provocative, student-friendly language:

- EQ1. What can we learn from the pattern of the sun's movement?
- EQ2. What can we learn by observing the patterns of the moon and stars?
- EQ3. How is the amount of daylight connected to the time of year?

**Big Ideas/ Enduring Understandings: *Students will understand that...***

EQ1/EQ2:

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted

EQ2:

- The appearance of the moon moving across the sky is a result of the moon's orbit around the Earth.
- The phases of the moon are a result of the Earth's rotation.

EQ3:

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted
- The amount of daylight is directly related to the tilt of the Earth, and varies with the seasons.

**A list of factual knowledge to be taught – *Students will know...***

EQ1:

- The sun can only be seen in the daytime.
- The sun appears to move across the sky, however, it is a fixed body. This is a result of the Earth's rotation.

EQ2:

- The moon can be observed sometimes at night and sometimes during the day.
- Stars can only be observed at night.
- The appearance of the moon changes in a cycle that takes about a month.

EQ1/2:

- The shape of the Earth is similar to a sphere.
- From Earth, many objects may be seen in the sky including the sun, the moon, stars and man-made objects
- The sun and moon appear to rise in one part of the sky, move across the sky, and set

EQ3:

- The pattern of day and night repeats every 24 hours.
- The amount of daylight increases from spring to summer, and then decreases from fall to winter.

**A list of skills to be taught or reinforced (including habits of mind) – *Students will be able to...***

EQ1:

- Make observations of the location of the sun throughout the day.

EQ2:

- Make observations of the location of the moon during the day and evening.
- Make observations and record data on the appearance of the moon over a period of time.

EQ1/2:

- Compare and contrast the patterns of movement of the sun and the moon.

EQ3:

- Compare length of daylight hours in different seasons. (amount of daylight in spring is greater than amount of daylight in winter, etc.)

## STAGE 2 – ASSESSMENT EVIDENCE

**Assessments** (Quizzes, tests, and a performance task to assess student mastery formatively and summatively, including an exemplar of proficient student work and a scoring guide for the performance task):

**1-ESS1-1 and 1-ESS1-2**

**Goal:** To observe and describe patterns of the sun, moon, stars, and the amount of daylight relative to the time of year by creating three models representing different times of the year and hours of the day.

**Role:** You are a first grader.

**Audience:** Your teacher and other first grade students.

**Situation:** The school newspaper is having a cartoon contest. You need to create a cartoon for the science section of the paper, showing the position of the sun throughout the day, and the length of daylight during either a winter or summer day.

**Product/Performance and Purpose:** Create a cartoon teaching your peers about the position of the sun and the length of daylight during either the summer or the winter. You will share your cartoon with your peers.

**Standards & Criteria for Success:**

Your cartoon should include the following:

- One box for breakfast time, one showing lunchtime, and one showing dinnertime.
- The position of the sun and/or moon in the sky in each box.
- Illustrations indicating whether your cartoon is occurring during the summer or the winter. (i.e. your character's clothing, background scenery such as a snowman or a tree full of leaves, etc.
- As an option, students could be asked to create more cartoons over a period of time (monthly, seasonally, etc) to analyze and interpret patterns. These cartoons could be kept in a journal.

# STAGE 3 – LEARNING PLAN

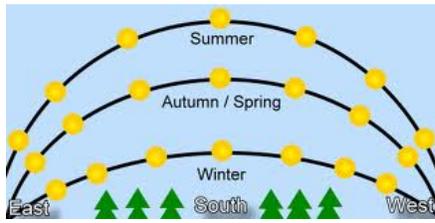
**Summary of Learning Activities** (Lectures, mini-lessons, read alouds, independent reading, films, website exploration, discussions, dialogues, debates, partner or small-group work, student presentations, reports, journals, reflections, in-class assessments, written reports, essays, research, and homework):

## Suggested Books:

- *Day and Night* by Margaret Hall
- *What Makes Day and Night?* by Franklin Branley
- *The Sun is My Favorite Star* by Frank Asch

## Possible Activities/Learning Experiences:

\*Create a diagram showing the different positions of the sun in different seasons, such as the picture below:



\*Have students keep a journal of what the moon looks like each night. A possible worksheet to use can be found at <http://www.nsta.org/elementaryschool/connections/200809MoonJournal.pdf>



\*A coloring book about the Sun, our nearest star:

[www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Our\\_Very\\_Own\\_Star\\_The\\_Sun.html](http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Our_Very_Own_Star_The_Sun.html)

\*Create models of the Earth, sun, and moon using students to demonstrate the rotation of the Earth. Sample lessons can be found at [www.eyeonthesky.org/ourstarsun.html](http://www.eyeonthesky.org/ourstarsun.html)

# STAGE 1 – DESIRED RESULTS

**Unit Title: Engineering Design**

**Grade Level: First**

**Length/Timing of Unit:**

**Teacher(s)/Designer(s): Pascack Valley Regional Science Committee**

**Science State standards addressed (verbatim):**

**K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.**

**K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.**

**K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.**

**Connections to Common Core Standards (verbatim):**

## **ELA/Literacy**

RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1)

W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including collaboration with peers (K-2ETS1-1), (K-2-ETS1-3)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1), (K-2-ETS1-3)

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2)

## **Mathematics**

MP.2 Reason abstractly and quantitatively. (K-2-ETS1-1), (K-2-ETS1-3)

MP.4 Model with mathematics. (K-2-ETS1-1), (K-2-ETS1-3)

MP.5 Use appropriate tools strategically. (K-2-ETS1-1), (K-2-ETS1-3)

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1), (K-2-ETS1-3)

**Essential Questions** (3-4) in provocative, student-friendly language:

- EQ1: What skills do engineers need to use to be successful?
- EQ2: Why are engineers needed?
- EQ3: What are the qualities of a good solution to a problem?

**Big Ideas/ Enduring Understandings: *Students will understand that...***

EQ1:

- Engineers use objects and materials to build things that help us survive.

EQ2:

- Engineers use their ideas to solve a problem or invent something that makes life easier.
- Math, Science, Technology and our thoughts and ideas can help us improve how we live and work.

EQ3:

- The solution that is created should make a difference or have an impact on the problem.
- There's more than one possible answer to solve a problem.
- Solutions need to be evaluated to determine which is the most effective.

**A list of factual knowledge to be taught – *Students will know...***

EQ1:

- Some tools or resources engineers use include rulers, thermometers, wood, nails, glue, paper, foam, plastic, cardboard and paint.

EQ3:

- Steps in the problem solving process include defining a problem to be solved, developing a goal and creating or inventing possible solutions to solve the problem, testing solutions, and evaluating successes and failures.

EQ1-3:

- Key vocabulary: engineer, solution, problem, tools, materials, resources

**A list of skills to be taught or reinforced (including habits of mind) – *Students will be able to...***

EQ1-3:

- Identify a problem.
- Develop a goal or plan on how to create a solution to the problem.
- Brainstorm and think about possible solutions to the problem.
- Organize their ideas into a plan.
- Create a sketch, drawing, or model to illustrate a solution.
- Give reasons to explain choices in shape, material, etc in a solution.
- Decide what tools or resources are needed to help them achieve their goal.
- Construct and build their plan.
- Observe, document, and measure to see if their plan meets the needs of their goal.
- Revise or edit their plan to work if the solution doesn't solve the problem.

# STAGE 2 – SAMPLE ASSESSMENT

**Assessments** (Quizzes, tests, and a performance task to assess student mastery formatively and summatively, including an exemplar of proficient student work and a scoring guide for the performance task):

## **K-2-ETS1-1, K-2-ETS1-2 and K-2-ETS1-3**

**Goal:** To ask questions and gather information about the problem the The Little Pigs have in order to test and develop a design solution, so that when the wolf comes to visit, he will not huff and puff and blow the house down.

**Role:** You are an engineer working for the third little pig from the story, “The Three Little Pigs.”

**Audience:** Your peers and your teacher (the big bad wolf)

**Situation:** Imagine that the big bad wolf is coming, and there are no bricks available. The third little pig has hired you to help him design and build a sturdy home.

**Product/Performance and Purpose:** Students will work in teams to design and build a house for the third little pig with the materials provided. Each house design will be tested by using a hair dryer or a fan to simulate the huffing and puffing of the wolf. If time allows, have the students work on improving their designs. Provide students with the following materials:

- Straws
- Toothpicks
- Craft sticks
- Linguini
- Plastic cups
- Paper clips
- Shaving Cream (optional)
- Small toy pig
- Hair dryer or fan
- Tape
- Toothpicks
- Marshmallows

### **Standards & Criteria for Success:**

- When designing and building your house:
  - Use only the materials provided.
  - There must be room for the pig to stand inside
  - There must be an entrance
  - It must withstand the wind from hairdryer/fan for 15 seconds
- Choose one material that you used in your solution. Draw a simple sketch of that object and develop an argument describing how the shape of the object helps it function as needed.
- Have the students work on improving their designs. Discuss what worked and what didn't work. What would they do differently next time. As a group, chart the strengths and weaknesses of each

group's designs on chart paper.

## STAGE 3 – LEARNING PLAN

**Summary of Learning Activities** (Lectures, mini-lessons, read alouds, independent reading, films, website exploration, discussions, dialogues, debates, partner or small-group work, student presentations, reports, journals, reflections, in-class assessments, written reports, essays, research, and homework):

### Suggested Videos:

\*episode of PBS series: Sid the Science Kid Engineers a Solution: Sid has a big problem -- he's trying to grab a cereal box located high up on the kitchen shelf, but he just cannot reach it. At school, Sid and his friends encounter another problem -- they need to get a ball down that got stuck in a tree. Susie tells them that if they have a problem, they should "engineer a solution." **The kids work as a team, brainstorming ideas, drawing pictures of their ideas and trying to build their ideas.** ([www.youtube.com](http://www.youtube.com), also found on Safari Montage)

\*episode of SciGirls: Puppet Power: In this episode of SciGirls, four girls design and build a huge puppet. For a local parade, the girls decide to create a larger-than-life puppet of a pig that will move its eyes, blow smoke from its nose and dance. Once the girls decide what they want to make, they get help from a local puppeteer and a nearby engineer. They brainstorm ideas, sketch designs and build prototypes of their designs. **When two girls come up with different designs for making the eyes blink, they have to choose one over the other. As the girls construct the puppet, they modify their design as needed.** After a lot of hard work, the girls march proudly in the parade.

### Suggested Books:

*Rocks, Jeans, and Busy Machines: An Engineering Kids Storybook* by Alane Rivera  
*Engineering Elephants* by Emily M. Hunt  
*Rosie Revere* by Andrea Beaty  
*The Three Little Pigs* retold by James Marshall  
*How a House is Built* by Gail Gibbons

### Additional Resources:

[www.speakaboos.com/story/the-three-little-pigs](http://www.speakaboos.com/story/the-three-little-pigs)

\*website with resources on engineering design: [www.pbslearningmedia.org](http://www.pbslearningmedia.org)

