MENDHAM TOWNSHIP SCHOOLS

SCIENCE CURRICULUM

Grade 2

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Curriculum Committee:
Julianne Kotcho- Principal
Carolyn Allen- Kindergarten
Brianna Boland- Gr. 2 Teacher
Cara Dawes- Gr. 3 Teacher
Erica Parke- Gr. 3 Teacher
Diane Barlow- Gr. 4 Teacher

Mendham Township School District
Science Curriculum
Grade 2

Grade 2 Unit 1: Material Magic (Physical Science)
Source - Science NJSLS Matter and Its Interactions

Stage 1 - Unit Summary

This unit develops the idea that by taking advantage of the properties of materials, we can solve many problems in our lives. Students will develop an appreciation for the manmade materials of everyday objects, and learn to recognize that those materials are chosen based on their properties. Through hands-on investigation, students will explore the material properties involved in meeting basic needs (such as clothing and cooking). They'll consider the solid and liquid states of matter to understand why plastic was invented. The unit ends with a brainstorming activity about futuristic inventions that might be possible using new materials.

Key Concepts Overview:

- ☐ Different materials have different properties.
- ☐ Studying the properties of materials allows us to engineer solutions to problems that people have.
- ☐ The different properties of materials lead to different processes when it comes time to recycle those materials.

This unit is based on 2-PS1-1, 2-PS1-2, 2-PS1-3, and 2-PS1-4.

Crosscutting Concepts:

Patterns:

- Patterns in the natural and human designed world can be observed. (2-PS1-1)

Cause and Effect

- Events have causes that generate observable patterns. (2-PS1-4)
- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2)

Energy and Matter

- Objects may break into smaller pieces and be put together into larger pieces or change shapes. (2- PS1-3)

Connections to Engineering, Technology, and Applications of Science

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

- Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (2-PS1-2)

Connections to Nature of Science

- Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena Scientists search for cause and effect relationships to explain natural events. (2-PS1-4)

Evidence Statements**: NJSLS Science Unit Standards (2-PS1-1, 2-PS1-2, 2-PS1-3, 2-PS1-4)**

Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. [Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.] **(2-PS1-1)**

Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. [Clarification Statement: Examples of properties could include strength,

flexibility, hardness, texture, and absorbency.] [Assessment Boundary: Assessment of quantitative measurements is limited to length.] **(2-PS1-2)**

Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. [Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.] **(2-PS1-3)**

Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. [Clarification Statement: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.] **(2-PS1-4)**

Engineering Design:

K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change (e.g., climate 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.

Essential Questions:

1. How do the properties of materials determine their use?
2. In what ways can an object made of a small set of pieces be disassembled and made into a new object?
3. Can all changes caused by heating or cooling be reversed?

Interdisciplinary Connections:
English Language Arts

- Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-PS1-4) **RI.2.1**
- Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-PS1-4) **RI.2.3**
- Describe how reasons support specific points the author makes in a text. (2-PS1-2), (2-PSI-4) **RI.2.8**
- Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section. (2-PS1-4) **W.2.1**
- Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-PS1-1),(2-PS1-2), (2-PS1-3) **W.2.7**
- Recall information from experiences or gather information from provided sources to answer a question. (2-PS1-1),(2-PS1-2),(K-2-ETS1-3) **W.2.8**
- 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) **SL.2.5**
- Compare and contrast the most important points presented by two texts on the same topic. (2-ESS2-1) **RI.2.9**

Mathematics

- Reason abstractly and quantitatively. (2-PS1-2), (K-2-ETS1-3) **MP.2**
- Model with mathematics. (2-PS1-1),(2-PS1-2, (K-2-ETS1-3)) **MP.4**
- Use appropriate tools strategically. (2-PS1-2), (K-2-ETS1-3) **MP.5**
- 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. (2-PS1-1),(2-PS1-2), (K-2-ETS1-3) **2.MD.D.10**

Stage 2 - Assessment

Essential Question #1: How do the properties of materials determine their use?

Concepts

- Students consider different materials that share similar properties and test the effect a material's properties have on its function.
- Some materials have properties that cause them to be better suited to a purpose.
- Students explore how the structure of a designed object relates to its function.

Formative Assessment

Students who understand the concepts can:

- Observe patterns in the natural and human-designed world.
- Plan and conduct an investigation to describe and classify different kinds of material by their observable properties.
    - Observations could include color, texture, hardness, and flexibility.
    - Patterns could include the similar properties that different materials share.

Essential Question #2: In what ways can an object made of a small set of pieces be disassembled and made into a new object?

Concepts

- Students consider the cause and effect of heat being added to meltable substances. They observe that when heat (energy) is applied to a meltable substance (matter) it changes shape.
- Students consider that matter can be broken into smaller pieces or change shapes. Students consider the cause and effect relationship between a material's properties and its uses.

Formative Assessment

Students who understand the concepts can:

- Break objects into smaller pieces and put them together into larger pieces or change shapes.
- Make observations (firsthand or from media) to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

Essential Question #3: Can all changes caused by heating or cooling be reversed?

Concepts

- Students consider the cause and effect of heat being added to meltable substances. They observe that when heat (energy) is applied to a meltable substance (matter) it changes shape.
- Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.

Formative Assessment

Students who understand the concepts can:

- Observe patterns in events generated due to cause-and-effect relationships.
- Construct an argument with evidence to support a claim. (For example, some changes caused by heating or cooling can be reversed, and some cannot.)
    - Examples of reversible changes could include:
        - ➢ Materials such as water and butter at different temperatures.
    - Examples of irreversible changes could include:
        - Cooking an egg
        - Freezing a plant leaf
        - Heating paper

Performance Assessment: *How do we recycle metal?*

In this performance task, students will observe how fire can be used to recycle some materials, but not others. Some changes caused by fire, such as melting, are reversible. Other changes, such as burning, are not reversible.

After a review of the Material Magic unit, students will record observations of the changes that metal and paper experience when they are exposed to fire. Then, they will use their observations of these changes to construct an argument about whether or not fire can be used to recycle each of those materials.

*See full performance task in Mystery Science: Material Magic unit.

Summative Assessment:

This is an opportunity for students to demonstrate mastery of the skills taught during a particular unit. (all resources are available on the Mystery Science website).

- Individual Lesson Assessments
- Unit Assessment
- Performance Task

Stage 3 - Learning Plan

Mystery Science Unit: Material Magic

➔ Follow lessons in order & see Mystery Science extension activities for each lesson.

Lesson 1: Why do we wear clothes? Students define the problem that a hat is needed to shade the sun. They carry out an investigation of the properties of the provided materials. Next, each student designs a solution by selecting materials to create a hat that blocks the sun. (DCI: PS1.A, ETS1.A, ETS1.B)

Lesson 2: Can you really fry an egg on a hot sidewalk? Students carry out an investigation to test if a material is an insulator. Analyzing the data, they determine which material they would use to pick up something hot. (DCI: PS1.A)

Lesson 3: Why are so many toys made out of plastic? Students conduct an investigation to determine which type of candy will melt in hot water. Analyzing the data, students compare their predictions to what actually occurred. Students engage in an argument as to which candy to mail using evidence from the investigation to support their claim. (DCI: PS1.A & PS1.B)

Lesson 4: What materials might be invented in the future? Students use a new material to design solutions to solve a real life problem. Students engage in an argument for the merits of their design. (DCI: PS1.A, ETS1.A, ETS1.B, ETS1.C)

Lesson 5: Could you build a house out of paper? Students design a solution to building a tall tower and a strong tower out of paper. They change the properties of paper by folding, bending and cutting paper.. Students model the building process by assembling small pieces in order to build an object. (DCI: PS1.A, ETS1.B, ETS1.C)

Additional lessons & activities:

- Exploring Reversible Changes of State and Exploring Irreversible Changes of State: These two lessons work together to explore reversible and irreversible changes of state through guided investigations. The PDF is a set of activities focusing on materials followed by some optional post-activity lessons.
- Discovering Science: Classifying and Categorizing Matter, Grades 2-3): This resource is a day, or longer, lab activity aimed for second and third grade students. The lesson starts with a guided discussion and an activity identifying and classifying materials, then it guides students through a series of observations of mixing and changing different materials of different states and observing the resulting effects. Overall, the lesson targets the states of matter, and forces and motion. Some of the ideas (i.e., gas and energy) are aimed at the third grader and beyond. Please note that the link above goes to a larger set of activities and you need to click on the link Discovering science: Classifying and categorizing matter grades 2-3.
- Materials and Their Properties, Lessons Comparing the Properties of Different Materials (p. 22) and Exploring Thermal Insulators and Conductors (p. 23): Students participate in an open-ended sort using various materials. Based on their self-selected categories, students explain their reasoning. Next, through a fair test trial, students use new information to decide, using evidence, which material is best suited for maintaining cold the longest.
- The Properties of Materials and their Everyday Uses: This wonderful set of lessons engage students in testing materials to understand their properties and discuss appropriate uses for the materials based on those properties. For example, one activity has the students examining the materials that a number of balls are made out of (plastic, rubber, aluminum, etc.) and describing the properties of the materials (light, stretchy, rigid). Next, the students test balls made of those materials for bouncing height and record their data. The students discuss which materials are best for bouncing and why. The teacher could choose to do all of the activities and have a robust alignment with the three dimensions of the NGSS PS1-2, an engineering physical science Performance Expectation.
- Matter song a music video by Untamed Science: This is an engaging music video that defines and gives examples of matter. The video is fun, colorful and explores many different kinds of matter as part of the music video sequence. Young students will love the song and the interactive dance sequences.
- Science Games For Kids- Properties of Materials: This resource is an interactive simulation designed to have students test various materials for different properties including flexibility, strength, waterproof, and transparency. The simulation includes a workshop where students can select different materials to see if the selected property matches the intended use.

Connections to STEM/Makerspace

- Bridge Challenge- Test certain materials for their strength and take notes on their observations. Use the engineering design process to build a bridge using the materials that they documented as the strongest.

Performance Assessment: *How do we recycle metal?*

In this performance task, students will observe how fire can be used to recycle some materials, but not others. Some changes caused by fire, such as melting, are reversible. Other changes, such as burning, are not reversible.

After a review of the Material Magic unit, students will record observations of the changes that metal and paper experience when they are exposed to fire. Then, they will use their observations of these changes to construct an argument about whether or not fire can be used to recycle each of those materials.

*See full performance task in Mystery Science: Material Magic unit.

Integrated accommodations and modifications for students with IEPs 504s, ELLs, and gifted and talented students:

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understanding.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

List of Core Instructional and Supplemental Materials:

- Mystery Science: Material Magic
- Discovery United Streaming
- Brainpop Jr. Educational Videos

Integration of 21st Century Skills and Life and Career Standards

CRP1, 2, 4, 6, 8, 11

Integration of the Technology Standard

NJSLS.8.1

Grade 2 Unit 2: Work of Water (Earth and Space Science)
Source - Science NJSLS Earth's Systems

Stage 1 - Unit Summary

This unit helps students develop the idea that water is a powerful force that reshapes the earth's surface. Students see that water isn't just something we drink. It carries sand to create beaches, carves out canyons and valleys and, as ice, scrapes entire areas flat.

Key Concepts Overview:

- ☐ Water and land interact with one another. Rivers flow downhill, and the flow of rivers erodes land.
- ☐ The process of erosion breaks rock down into smaller and smaller pieces and transports those pieces to new places. Those rock pieces can change the color of the river as well as the color of the land where they end up.
- ☐ Flowing water and changing land can impact humans in positive and negative ways.

This unit is based on 2-ESS1-1, 2-ESS2-2, and 2-ESS2-3.

Crosscutting Concepts:

Patterns

- Patterns in the natural world can be observed. (2-ESS2-2), (2-ESS2-3)

Stability and Change

- Things may change slowly or rapidly. (2-ESS2-1)

Connections to Engineering, Technology, and Applications of Science

- Influence of Engineering, Technology, and Science on Society and the Natural World Developing and using technology has impacts on the natural world. (2-ESS2-1)

Connections to Nature of Science

- Science Addresses Questions About the Natural and Material World Scientists study the natural and material world. (2-ESS2-1)

Evidence Statements: **NJSLS Science Unit Standards (2-ESS2-1, 2-ESS2-2, &2-ESS2-3)**

Use information from several sources to provide evidence that Earth events can occur quickly or slowly. [Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.] [Assessment Boundary: Assessment does not include quantitative measurements of timescales.] **(2-ESS1-1)**

Develop a model to represent the shapes and kinds of land and bodies of water in an area. [Assessment Boundary: Assessment does not include quantitative scaling in models.] **(2-ESS2-2)**

Obtain information to identify where water is found on Earth and that it can be solid or liquid. (2-ESS2-3)

Engineering Design:

K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change (e.g., climate 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.

Essential Questions:

1. How can we identify where water is found on Earth and if it is solid or liquid?
2. In what ways can you represent the shapes and kinds of land and bodies of water in an area?
3. In what ways do humans slow or prevent wind or water from changing the shape of the land?
4. What evidence can we find to prove that Earth events can occur quickly or slowly?

Interdisciplinary Connections:

English Language Arts

- Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-PS1-4) **RI.2.1**
- Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS2-1) **RI.2.3**
- Compare and contrast the most important points presented by two texts on the same topic. (2-ESS2-1) **RI.2.9**
- With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (2-ESS2-3) **W.2.6**
- Recall information from experiences or gather information from provided sources to answer a question. (2-ESS2-3) **W.2.8**
- Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. (2-ESS1-1) **SL.2.2**
- 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. (2-ESS2-2) **SL.2.5**
- Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-PS1-1),(2-PS1-2), (2-PS1-3) **W.2.7**

Mathematics

- Reason abstractly and quantitatively. (2-ESS2-1),(2-ESS2-2) **MP.2**
- Model with mathematics. (2-ESS2-1), (2-ESS2-2) **MP.4**
- Use appropriate tools strategically. (2-ESS2-1) **MP.5**
- Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. (2-ESS2-2) **2.NBT.A.3**
- Understand place value. (2-ESS1-1) **2.NBT.A**
- Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. (2-ESS2-1) **2.MD.B.5**

Stage 2 - Assessment

Essential Question #1: How can we identify where water is found on Earth and if it is solid or liquid?

Concepts

- Patterns in the natural world can be observed.
- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form.

Formative Assessment

Students who understand the concepts are able to:

- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) and other media that will be useful in answering a scientific question.
- Obtain information to identify where water is found on Earth and to communicate that it can be a solid or liquid.

Essential Question #2: In what ways can you represent the shapes and kinds of land and bodies of water in an area?

Concepts

- Maps show where things are located. One can map the shapes and kinds of land and water in any area.

Formative Assessment

Students who understand the concepts are able to:

- Observe patterns in the natural world.
- Develop a model to represent patterns in the natural world.
- Develop a model to represent the shapes and kinds of land and bodies of water in an area. (Assessment does not include quantitative scaling in models.)

Essential Question #3: In what ways do humans slow or prevent wind or water from changing the shape of the land?

Concepts

- Things may change slowly or rapidly.
- Developing and using technology has impacts on the natural world.
- The shape and stability of structures of natural and designed objects are related to their function(s).
- Wind and water can change the shape of the land.
- Because there is always more than one possible solution to a problem, it is useful to compare and test designs.
- A situation that people want to change or create can be approached as a problem to be solved through engineering.
- Asking questions, making observations, and gathering information are helpful in thinking about problems.
- Before beginning to design a solution, it is important to clearly understand the problem.
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

Formative Assessment

Students who understand the concepts are able to:

- Compare multiple solutions to a problem.
- Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. Examples of solutions could include:
- Different designs of dikes and windbreaks to hold back wind and water
- Different designs for using shrubs, grass, and trees to hold back the land.
- Ask questions based on observations to find more information about the natural and/or designed world.
- 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.
- Define a simple problem that can be solved through the development of a new or improved object or tool.
- Develop a simple model based on evidence to represent a proposed object or tool.
- 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.

Essential Question #4: What evidence can we find to prove that Earth events can occur quickly or slowly?

Concepts

- Some events happen very quickly; others occur very slowly over a time period much longer than one can observe.

Formative Assessment

Students who understand the concepts are able to:

- Make observations from several sources to construct an evidence-based account for natural phenomena.
- Use information from several sources to provide evidence that Earth events can occur quickly or slowly. (Assessment does not include quantitative measurements of timescales.) Some examples of these events include:
  - ➢ Volcanic explosions
  - ➢ Earthquakes
  - ➢ Erosion of rocks

Performance Assessment: *How long is the shortest river?*

In this performance task, students explore the difficulty of measuring the length of a river. Figuring out which river is the shortest river is difficult to do if you can't decide where a river starts or ends.

After a review of the Work of Water unit, students will learn about two rivers that are each possibly the shortest rivers in the United States. Then, they map those rivers out and attempt to determine which river is the shortest.

*See full performance task in Mystery Science: Work of Water unit.

Stage 3 - Learning Plan

Mystery Science: Work of Water

➔ Follow lessons in order & see Mystery Science extension activities for each lesson.

Lesson 1: If you floated down a river, where would you end up? Students develop a model of the earth's surface and carry out an investigation to discover how rivers flow. They construct an explanation about where on the earth's surface rivers start and end. (DCI: ESS2:B & ESS2.C)

Lesson 2: Why is there sand at the beach? Students conduct an investigation by modeling how rocks tumble through a river and break. Students construct an explanation for why there is sand at the beach. (DCI: ESS2. A, ESS2:B, ESS2.C)

Lesson 3: What's strong enough to make a canyon? Students conduct an investigation by modeling what happens to land when it rains over and over. Students construct an explanation for how the water changed the land. (DCI: ESS1.C, ESS2.A, ESS2:B, ESS2.C)

Lesson 4: How can you stop a landslide? Students define the problem that landslides create. They design solutions to stabilize soil and prevent landslides. Students compare their solutions and engage in argument from this evidence to determine which designs are most effective. (DCI: ESS1.C, ESS2.A, ETS1.A, ETS1.B, ETS1.C)

Additional lessons & activities:

- How Can Water Change the Shape of the Land? In this lesson plan, children investigate water erosion. Students make a sand tower and observe the erosion as they drop water on it. Students observe, illustrate, and record notes about the process. Short videos and a read aloud also further support understanding of the Performance Expectation.
- How Can Wind Change the Shape of the Land? This lesson builds on another lesson created by Jeri Faber in which students discovered how water changes the earth. For this lesson, students take part in a teacher-led

investigation to show how wind changes the land. The children use straws to blow on a small mound or hill of sand. As each child takes a turn, the other students record their detailed observations that will later be used to draw conclusions. Students also watch a short video on wind erosion and discuss the new learning with partners.

- Finding Erosion at Our School In this lesson, students walk around the school grounds, neighborhood, or another area of their community to locate evidence of erosion. Various problems caused by erosion are discussed and a solution is developed for one of the problems. This lesson is one in a series on erosion by Jeri Faber. A follow-up lesson is available where students compare their erosion design solutions.

Connections to STEM/Makerspace

- Make a model, drawing, or paint a picture of a land or water area that exists in NJ.

Performance Assessment: *How long is the shortest river?*

In this performance task, students explore the difficulty of measuring the length of a river. Figuring out which river is the shortest river is difficult to do if you can't decide where a river starts or ends.

After a review of the Work of Water unit, students will learn about two rivers that are each possibly the shortest rivers in the United States. Then, they map those rivers out and attempt to determine which river is the shortest.

- See full performance task in Mystery Science: Work of Water unit.

Summative Assessment: This is an opportunity for students to demonstrate mastery of the skills taught during a particular unit. (all resources are available on the Mystery Science website).

- Individual Lesson Assessments
- Unit Assessment
- Performance Task

Integrated accommodations and modifications for students with IEPs 504s, ELLs, and gifted and talented students:

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

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- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

List of Core Instructional and Supplemental Materials:

- Discovery United Streaming

● Brainpop Jr. Educational Videos ● Mystery Science: Work of Water
Integration of 21st Century Skills and Life and Career Standards CRP1, 2, 4, 6, 8, 11
Integration of the Technology Standard NJSLS.8.1

Grade 2 Unit 3: Animal Adventures (Life Science)
Source - Science NJSLS Ecosystems: Interactions, Energy, and Dynamics

Stage 1 - Unit Summary

This unit helps students develop a sense of wonder for biodiversity: the sheer range and variety of animals found on earth. Students gain practical experience in identifying animals and sorting them into scientific groups, and apply their knowledge in an engineering design challenge. This unit introduces two critically important concepts in biology: "habitat" and "species," foundational concepts which will be revisited and refined at higher grade levels.

Key Concepts Overview:

- ☐ Habitats change over time. This can cause the living things in those habitats to change too.
- ☐ Fossils provide evidence of how living things used to look and behave. They also provide evidence about the habitats in which those living things existed.
- ☐ Some changes to habitats and to living things are caused by human activities and others are caused by natural processes.

This unit is based on 2-LS4-1, 2-LS2-1, 2-LS2-2, and K-2-ETS1-1.

Crosscutting Concepts:

Cause and Effect

- Events have causes that generate observable patterns. (2-LS2-1)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)

Connections to Nature of Science

- Scientific Knowledge is Based on Empirical Evidence Scientists look for patterns and order when making observations about the world. (2-LS4-1)

Evidence Statements**:** **NJSLS Science Unit Standards** **(2-LS41, 2-LS2-1, 2-LS2-2)**

Make observations of plants and animals to compare the diversity of life in different habitats. [Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.] **(2-LS4-1)**

Plan and conduct an investigation to determine if plants need sunlight and water to grow. [Assessment Boundary: Assessment is limited to testing one variable at a time.] **(2-LS2-1)**

Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.* (2-LS2-2)

Engineering Design:

K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change (e.g., climate 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.

Essential Questions:

1. How does the diversity of plants and animals compare among different habitats?
2. What do plants need to live and grow?
3. Why do some plants rely on animals for reproduction?

Interdisciplinary Connections:

English Language Arts

- Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1) **W.2.7**
- Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1),(K-2-ETS1-1) **W.2.8**
- 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. (2-LS2-2) **SL.2.5**
- With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1) **W.2.6**
- 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) **RI.2.1**

Mathematics

- Reason abstractly and quantitatively. (2-LS2-1),(K-2-ETS1-1) **MP.2**
- Model with mathematics. (2-LS2-1),(2-LS2-2),(K-2-ETS1-1) **MP.4**
- Use appropriate tools strategically. (2-LS2-1),(K-2-ETS1-1) **MP.5**
- 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. (2-LS2-2) **2.MD.D.10**

Stage 2 - Assessment:

Essential Question #1: How does the diversity of plants and animals compare among different habitats?

Concepts

- Habitats change over time which can cause the living things in those habitats to change too. Changes can be caused by human activities or natural processes.
- Fossils provide evidence of how living things used to look and behave. They also provide evidence about the habitats in which those living things existed.

Formative Assessment

Students who understand the concepts can:

- Look for patterns and order when making observations about the world.
- Make observations of plants and animals to compare the diversity of life in different habitats. (Note: The emphasis is on the diversity of living things in each of a variety of different habitats; assessment does not include specific animal and plant names in specific habitats.)

Essential Question #2: What do plants need to live and grow?

Concepts

- Events have causes that generate observable patterns.
- Plants depend on water and light to grow.

Formative Assessment

Students who understand the concepts can:

- Observe patterns in events generated by cause-and-effect relationships.
- Plan and conduct an investigation to determine whether plants need sunlight and water to grow. (Note: Assessment is limited to one variable at a time.)

Essential Question #3: Why do some plants rely on animals for reproduction?

Concepts

- The shape and stability of structures of natural and designed objects are related to their function.
- Plants depend on animals for pollination or to move their seeds around.
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

Formative Assessment

Students who understand the concepts can:

- Describe how the shape and stability of structures are related to their function.
- Develop a simple model based on evidence to represent a proposed object or tool.
- Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
- 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.

Performance Assessment: *Where else do bats live?*

In this performance task, students explore and compare two very different places that Mexican free-tailed bats live.

After a review of the Animal Adventures unit, students will learn about a new location where a different colony of bats lives. Then, they compare and contrast the physical environment and the other living things that can be found in each place.

*See full performance task in Mystery Science: Animal Adventures unit.

Summative Assessment:

This is an opportunity for students to demonstrate mastery of the skills taught during a particular unit. (all resources are available on the Mystery Science website).

- Individual Lesson Assessments
- Unit Assessment
- Performance Task

Stage 3 - Learning Plan

Mystery Science: Animal Adventures

➔ Follow lessons in order & see Mystery Science extension activities for each lesson.

Lesson 1: How many different kinds of animals are there? Students evaluate and communicate information by sorting animals based on their traits and explaining their choices. Then, students sort the animals based on the traits scientists use to classify the animals as mammals, birds, reptiles, and invertebrates. Students determine which group 'challenge animals' belong to, based on their characteristics. (DCI: LS4.D)

Lesson 2: Why do frogs say "ribbit"? Students listen to a variety of frog calls, then analyze the sounds from two different habitats to determine which frogs are there. They then construct an argument from evidence about which habitat is more biodiverse based on the amount of different frog calls. (DCI: LS4.D)

Lesson 3: How can you get more birds to visit a bird feeder? Students define a problem by stating which type of bird they want to design a bird feeder for, and what its needs are. Each student designs a solution by comparing multiple sketches and developing a model of a bird feeder that best meets the needs of the bird they want to attract. Students reflect on how to improve their prototype. (DCI: LS4.D)

Additional lessons & activities:

- Who Needs What? Students identify the physical needs of animals. Through classroom discussion, students speculate on the needs of plants. With teacher guidance, students then design an experiment that can take place in the classroom to test whether or not plants need light and water in order to grow. Students conduct the associated activity in which sunflower seeds are planted in plastic cups, and once germinated, are exposed to different conditions. In the classroom setting, students test for the effects of light versus darkness, and watered versus non-watered conditions. During exposure of the plants to these different conditions, students measure growth of the seedlings every few days using non-standard measurement. After a few weeks, students compare the growth of plants exposed to the different conditions, and make pictorial bar graphs that demonstrate these comparisons.
- I Scream, You Scream, We All Scream for Vanilla Ice Cream! In this lesson students design a vanilla plant pollinator. This is an end-of-the-unit task, taking about 3 days to complete. The students will view an amazing video that tells about the problems with pollinating vanilla by hand. The students pretend to be employees of Ben and Jerry's ice cream company and help to plan and design a pollinator for the vanilla plant so that the great vanilla flavored ice cream can continue to be produced. (This is the first of several lessons created by Jeri Faber on plant pollination at: betterlessons.com/)
- Two Scoops Are Better Than One: This lesson is the second day of an end of the unit task to address the Performance Expectation: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. This end of unit task is expected to take 3-4 days to complete. In the previous lesson (http://betterlesson.com/lesson/628130/i-scream-you-scream-we-all-scream-for-vanilla-ice-cream), the students were challenged to brainstorm their version of a vanilla flower pollinator. For this lesson, students work with a partner to choose and develop their engineering plans by drawing a diagram for a vanilla plant pollinator. They also create a list of materials needed for the task.

Connections to STEM/Makerspace

Lesson 4 - Polar (Habitat)

Performance Assessment: *Where else do bats live?*

In this performance task, students explore and compare two very different places that Mexican free-tailed bats live.

After a review of the Animal Adventures unit, students will learn about a new location where a different colony of bats lives. Then, they compare and contrast the physical environment and the other living things that can be found in each place.

*See full performance task in Mystery Science: Animal Adventures unit.

Integrated accommodations and modifications for students with IEPs 504s, ELLs, and gifted and talented students:

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).

- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understanding.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

List of Core Instructional and Supplemental Materials:

- Mystery Science: Animal Adventures
- Discovery United Streaming
- Brainpop Jr. Educational Videos
- Vibrating Bumblebee
- Creating animals that disperse seeds
- Animal Diversity
- Habitat Detectives
- Exploring MicroHabitats
- 35 animals in Costa Rica
- Habitat in a Bucket
- Invent an Insect
- Wonders of the rainforest
- Rainforest song

Integration of 21st Century Skills and Life and Career Standards

CRP1, 2, 4, 6, 8, 11

Integration of the Technology Standard

NJSLS.8.1

Grade 2 Unit 4: Plant Adventures (Life Science)
Source - Science NJSLS Ecosystems: Interactions, Energy, and Dynamics

Stage 1 - Unit Summary

This unit develops the idea that plants are truly alive and face challenges every bit as dramatic as those of animals. Students will learn that plants have needs, and will reason from evidence to understand how plants meet their needs.

Key Concepts Overview:

- ☐ Habitats change over time. This can cause the living things in those habitats to change too.
- ☐ Fossils provide evidence of how living things used to look and behave. They also provide evidence about the habitats in which those living things existed.
- ☐ Some changes to habitats and to living things are caused by human activities and others are caused by natural processes.

This unit is based on 2-LS4-1, 2-LS2-1, 2-LS2-2, and K-2-ETS1-1.

Crosscutting Concepts:

Cause and Effect

- Events have causes that generate observable patterns. (2-LS2-1)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)

Connections to Nature of Science

- Scientific Knowledge is Based on Empirical Evidence Scientists look for patterns and order when making observations about the world. (2-LS4-1)

Evidence Statements**: NJSLS Science Unit Standards (2-LS41, 2-LS2-1, 2-LS2-2)**

Make observations of plants and animals to compare the diversity of life in different habitats. [Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.] **(2-LS4-1)**

Plan and conduct an investigation to determine if plants need sunlight and water to grow. [Assessment Boundary: Assessment is limited to testing one variable at a time.] **(2-LS2-1)**

Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.* (2-LS2-2)

Engineering Design:

K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change (e.g., climate 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.

Essential Questions:

1. How does the diversity of plants and animals compare among different habitats?
2. What do plants need to live and grow?

3. Why do some plants rely on animals for reproduction?

Interdisciplinary Connections:

English Language Arts

- Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1) **W.2.7**
- Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1),(K-2-ETS1-1) **W.2.8**
- 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. (2-LS2-2) **SL.2.5**
- With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1) **W.2.6**
- 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) **RI.2.1**

Mathematics

- Reason abstractly and quantitatively. (2-LS2-1),(K-2-ETS1-1) **MP.2**
- Model with mathematics. (2-LS2-1),(2-LS2-2),(K-2-ETS1-1) **MP.4**
- Use appropriate tools strategically. (2-LS2-1),(K-2-ETS1-1) **MP.5**
- 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. (2-LS2-2) **2.MD.D.10**

Stage 2 - Assessment

Essential Question #1: How does the diversity of plants and animals compare among different habitats?

Concepts

- People look for patterns and order when making observations about the world.
- There are many different kinds of living things in any area, and they exist in different places on land and in water.

Formative Assessment

Students who understand the concepts can:

- Look for patterns and order when making observations about the world.
- Make observations (firsthand or from media) to collect data that can be used to make comparisons.
- Make observations of plants and animals to compare the diversity of life in different habitats. (Note: The emphasis is on the diversity of living things in each of a variety of different habitats; assessment does not include specific animal and plant names in specific habitats.)

Essential Question #2: What do plants need to live and grow?

Concepts

- Events have causes that generate observable patterns.
- Plants depend on water and light to grow.

Formative Assessment

Students who understand the concepts can:

- Observe patterns in events generated by cause-and-effect relationships.
- Plan and conduct an investigation collaboratively to produce data to serve as a basis for evidence to answer a question.
- Plan and conduct an investigation to determine whether plants need sunlight and water to grow. (Note: Assessment is limited to one variable at a time.)

Essential Question #3: Why do some plants rely on animals for reproduction?

Concepts

- The shape and stability of structures of natural and designed objects are related to their function.
- Plants depend on animals for pollination or to move their seeds around.
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

Formative Assessment

Students who understand the concepts can:

- Describe how the shape and stability of structures are related to their function.
- Develop a simple model based on evidence to represent a proposed object or tool.
- Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
- 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.

Performance Assessment

*There is no performance assessment for this unit, but you can supplement the Animal Adventure performance task.

Summative Assessment

This is an opportunity for students to demonstrate mastery of the skills taught during a particular unit. (all resources are available on the Mystery Science website).

- Individual Lesson Assessments
- Unit Assessment
- Performance Task

Stage 3 - Learning Plan

Mystery Science: Plant Adventures

➔ Follow lessons in order & see Mystery Science extensions for each lesson.

Lesson 1: How did a tree travel halfway around the world? Students model seed dispersal by creating three different seed flyers. They investigate how each seed flyers' structure helps the seed disperse. (DCI:LS2.A)

Lesson 2: Could a plant survive without light? Students plan and carry out an investigation to determine how light affects plant growth. They grow some radish seeds in light conditions and some radish seeds in dark conditions and then analyze their data through close observations of the plants after several days. (DCI:LS2.A)

Lesson 3: Why do trees grow so tall? Students make a Grass Head and conduct an investigation to determine the sun's impact on the direction plants grow. Analyzing data, students predict growth patterns of plants. (DCI:LS2.A)

Lesson 4: Should you water a cactus? Students analyze the data from their Grass Head in Lesson 3. They compare their growth pattern prediction with the actual results to determine if the grass grew in the direction of the sunlight. (DCI:LS2.A & LS4.D)

Lesson 5: Where do plants grow best? Students engage in a model simulation of a farm with different growing conditions in different areas of the farm. Students consider the needs of a plant in order to determine where it will grow best. (DCI:LS2.A & LS4.D)

Additional lessons & activities:

- Do Plants Need Sunlight? Students will explore the importance of sunlight for a plant's survival by conducting an investigation. Each group of students will cover parts of plants' leaves with black construction paper and make observations of the plant's leaves over several days. This lesson serves to model the process of investigation. The investigation will take 7 days to complete. Then students can remove the black paper, place the plants back in the sunlight, and view the leaves in a second investigation. (Note: Chlorophyll is not a necessary concept/vocabulary term to address in this lesson.)
- Building and Testing Our Vanilla Plant Pollinator: In previous lessons designed by Jeri Faber, students have learned about how animals help pollinate flowers. The students have also planned and designed their own vanilla plant pollinator. In this lesson, students use the engineering design process to build and test the plant pollinator they planned the day before in class.
- Two Scoops Are Better Than One: This lesson is the second day of an end of the unit task to address the Performance Expectation: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. This end of unit task is expected to take 3-4 days to complete. In the previous lesson (http://betterlesson.com/lesson/628130/i-scream-you-scream-we-all-scream-for-vanilla-ice-cream), the students were challenged to brainstorm their version of a vanilla flower pollinator. For this lesson, students work with a partner to choose and develop their engineering plans by drawing a diagram for a vanilla plant pollinator. They also create a list of materials needed for the task.
- Improving Our Vanilla Bean Pollinators: This lesson is part of a series of lessons created by Jeri Faber on using the engineering design process to solve a problem. In the Ice Scream, You Scream We All Scream for Vanilla Ice Cream, the students were challenged to design a vanilla flower plant pollinator. For day 2, Two Scoops Are Better Than One, students worked with a partner to determine which design to build for their vanilla plant pollinator. For day 3, Building and Testing Our Vanilla Pollinators, the students constructed and tested the effectiveness of their pollinators based on the design plans. In this lesson, students improve their plant pollinator models and retest the pollinator's effectiveness.
- The Bug Chicks-Mission: Pollination (Episode 5): The Bug Chicks' five minute video provides a fun, animated way of learning about the fascinating world of pollination and insects. In this video, the students observe interesting museums and habitats to look at lesser known insect pollinators. The student challenge at the end leads students into their environment to look for other pollinators and encourages them to bring their observations back to the classroom to discuss.

Connections to STEM/Makerspace

Lesson 4 - Polar (Habitat)

Performance Assessment: There is no performance assessment for this unit, but you can supplement the Animal Adventure performance assessment.

Integrated accommodations and modifications for students with IEPs 504s, ELLs, and gifted and talented students:

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
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- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

List of Core Instructional and Supplemental Materials:

- Mystery Science: Plant Adventures
- Discovery United Streaming
- Brainpop Jr. Educational Videos
- How to pollinate a passion fruit
- Pollination Activity
- Pollination Phenomenon
- Vibrating Bumblebee
- Creating animals that disperse seeds
- A sticky Situation
- Pollinator Lessons
- Habitat Detectives
- Habitat in a Bucket

Integration of 21st Century Skills and Life and Career Standards

CRP1, 2, 4, 6, 8, 11

Integration of the Technology Standard

NJSLS.8.1

Pacing Guide

Unit Topic	NJSLS	Marking Period	Duration in Weeks
Material Magic	Matter and Its Interactions	1	5-10 weeks
Work of Water	Earth's Systems	2	4-8 weeks
Animal Adventures	Ecosystems: Interactions, Energy, and Dynamics	3	3-6 weeks
Plant Adventures	Ecosystems: Interactions, Energy, and Dynamics	4	5-10 weeks

Total: 30 weeks