Hoboken Public Schools

Science Curriculum
Grade One
Course Description

Based on the Next Generation Science Standards, the Hoboken Public Schools first grade science program is designed to introduce and develop a foundation in science through five major units of study. These units are: Sound/Light Waves, From Molecules to Organisms: Structures and Processes, Heredity: Inheritance and Variation of Traits, Earth’s Place in the Universe, and Engineering Design. Lessons are taught with concrete, hands-on activities that allow first time science experiences to leave lasting impressions.

The performance expectations in first grade help students formulate answers to questions such as: “What happens when materials vibrate? What happens when there is no light? What are some ways plants and animals meet their needs so that they can survive and grow? How are parents and their children similar and different? What objects are in the sky and how do they seem to move?”

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

Course Resources

- New Jersey Center for Teaching and Learning (NJCTL)
  https://www.njctl.org/courses/science/1st-grade-science/
- Various leveled non-fiction books for each unit of study
- Next Generation Science Standards:
- For differentiation, students, parents and teachers will access Science A to Z http://www.sciencea-z.com/
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<th>Unit #</th>
<th>Science Unit Title</th>
<th>NGSS</th>
<th>PLTW Module</th>
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<td>1-PS4-1, 1-PS4-2, 1-PS4-3, 1-PS4-4</td>
<td>Light &amp; Sound (PLTW ONLY)</td>
<td>1-PS4-1, 1-PS4-2, 1-PS4-3, 1-PS4-4, K-2-ETS1-1, K-2-ETS1-2, K-2-ETS1-3</td>
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<td>2</td>
<td>Earth’s Place in the Universe</td>
<td>1-ESS1-1, 1-ESS1-2</td>
<td>Light: Observing the Sun, Moon &amp; Stars (PLTW ONLY)</td>
<td>1-PS4-2, 1-ESS1-1, 1-ESS1-2, K-2-ETS1-1, K-2-ETS1-2, K-2-ETS1-3</td>
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<td>3</td>
<td>Heredity: Inheritance and Variation of Traits</td>
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<td>Science Fusion</td>
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<td>5</td>
<td>Computer Science</td>
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<td>Animated Storytelling (PLTW ONLY)</td>
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**Unit 1 – Waves and their Applications in Technologies for Information Transfer**  
Unit 1 September-October

**Unit 1 Overview**  
All products created by designers and engineers were created to meet a human need or want. One of the most basic of human needs is to communicate over a distance. In this module students will investigate light and sound, including vibration from sound waves and the effect of different materials on the path of a beam of light. The students will use design process to sketch, build, test, and reflect on a device that uses light or sound to communicate over a distance.

Students read about three fictional characters facing a similar design problem. Mylo, Suzie, and Angelina are lost and need to use only the materials in their backpacks to communicate using light or sound.

**Essential Questions**
- How can we see objects? How does light affect the way we see objects?
- How do all objects allow light to pass through them? What materials allow light to pass through them?
- How are shadows created?
- How can a light beam be redirected?
- How are the properties of waves identified?
- How can sound make matter vibrate? Can vibrating matter make sound?

**Essential Learning Outcomes**
- Students will be able to make observations to construct an evidence-based account that objects can be seen only when illuminated. (1-PS4-2)
➢ Students will be able to plan and conduct an investigations to determine the effect of placing objects made with different materials in the path of a beam of light. (1-PS4-3)
➢ Students will be able to explore the use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. (1-PS4-4)
➢ Students will be able to plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. (1-PS4-1)

Technology Infusion

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Standards Addressed:
Physical Science:

1-PS4-1:
PS4.A

1-PS4-2:
PS4.B

1-PS4-3:
PS4.B

1-PS4-4:
PS4.C

Differentiation
➢ Mixed ability grouping to ensure the success of all the students
➢ Writing assignments and expectations varied based on student’s ability
➢ Organizers to provide guidance on writing tasks
➢ Leveled nonfiction books
➢ Activities and experiments aimed to provide opportunities for students to utilize their strengths and appeal to individual interests
➢ Small group and individual guidance and support
➢ Use of computers as an aide for writing projects and research
➢ Small group and Independent learning activities with expectations based on the student or group’s ability.
Assessments

- Class participation
- Completion of activity sheets
- Discussions demonstrating knowledge of subject matter
- Interactive journal responses
- Responses
- Academic Vocabulary

21st Century Learning Connection

Problem Solving: Students will work in groups to use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. Have students present and discuss their device with the class.

Unit 2 From Molecules to Organisms: Structures and Processes
Unit 2 November-December

Unit 2 Overview

In this module students are presented with the problem of preparing an ideal traveler for a visit to an extreme environment and designing the ideal shoe for this traveler to wear in this environment. Students will look to plant and animal adaptations to guide them as they make choices about how to prepare their traveler. Students will learn what it means for an organism to be adapted to its environment and how different adaptations can be categorized. Through various investigations, students will explore an example of adaptations for protection, camouflage, food, and locomotion. They will complete an inquiry investigation to explore how different beak shapes are best adapted for gathering different foods. They will then investigate organisms that live in an extreme environment and document the variety of adaptations that each of these organisms display. Students will combine all of their knowledge of plant and animal adaptations with their understanding of the extreme environment to prepare their traveler and design their shoe.

Essential Questions

- How do different animals use their body parts to see, hear, grasp objects, protect themselves, move from place to place, and seek, find and take in food, water, and air?
- How are the parts of a plant that helps them survive and grow?
- How do the body parts of animals have capture and convey different kinds of information needed for growth and survival?
  a. How do animals respond to these pieces of information?
  b. What behaviors help animals survive?
  c. How do plants respond?
- How can adult plant and animals have young?
- What kinds of behaviors do animal parents and their offspring engage in to help them survive?

Essential Learning Outcomes

- Students will be able to explore the use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. (1-LS1-1)
- Students will understand how to read texts and use media to determine patterns in behavior of
parents and offspring that help offspring survive. (1-LS1-2)

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**Standards Addressed:**

**Life Science:**

1-LS1-1:
- LS1.A
- LS1.D

1-LS1-2:
- LS1.B

**Differentiation**

- Small group and Independent learning activities with expectations based on the student or group’s ability.
- Mixed ability grouping to ensure the success of all the students
- Writing assignments and expectations varied based on student’s ability
- Organizers to provide guidance on writing tasks
- Leveled nonfiction books
- Activities and experiments aimed to provide opportunities for students to utilize their strengths and appeal to individual interests
- Small group and individual guidance and support
- Use of computers as an aide for writing projects and research

**Assessments**

- Class participation
- Completion of activity sheets
- Discussions demonstrating knowledge of subject matter
- Interactive journal responses
- Responses
- Academic Vocabulary

**21st Century Learning Connection**

"21st century skills" are the skills that today's students will need to be successful in this ever-changing world. The most recognizable of these skills are the 4C’s: communication, collaboration, critical thinking and creativity. However, 21st century skills also include social and emotional intelligence, technological literacy and problem solving abilities. These skills emphasize "application of knowledge" and go beyond rote memorization.
Unit 3 - Heredity: Inheritance and Variation of Traits
Unit 3 January-February

Unit 3 Overview
The performance expectations in Heredity: Inheritance and Variation of Traits help students formulate answers to the questions: “How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?”

Students are able to ask questions, make and defend a claim, and use concepts of probability to explain the genetic variation in a population. Students demonstrate understanding of why individuals of the same species vary in how they look, function, and behave. Students can explain the mechanisms of genetic inheritance and describe the environmental and genetic causes of gene mutation and the alteration of gene expression. Crosscutting concepts of patterns and cause and effect are called out as organizing concepts for these core ideas.

Essential Questions
- How are young animals and their parents alike? How are they different?
- How are young plants and their parents alike? How are they different?
- How can plants or animals of the same kind vary from one another?
- How do plants and animals inherit traits from their parents?
- How some of the traits vary from their parents?

Essential Learning Outcomes
- Students will be able to make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. (1-LS3-1)

Technology Infusion

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Standards Addressed:
Life Science:

1-LS3-1:
LS3.A
LS3.B

Differentiation
- Mixed ability grouping to ensure the success of all the students
- Writing assignments and expectations varied based on student’s ability
Organizers to provide guidance on writing tasks
Leveled nonfiction books
Activities and experiments aimed to provide opportunities for students to utilize their strengths and appeal to individual interests
Small group and individual guidance and support
Small group and Independent learning activities with expectations based on the student or group’s ability.
Use of computers as an aide for writing projects and research

Assessments
- Class participation
- Completion of activity sheets
- Discussions demonstrating knowledge of subject matter
- Interactive journal responses
- Responses
- Academic Vocabulary

21st Century Learning Connection
Students can use the 5th Grade PLTW modules that provides experiences that heighten young students’ awareness of the different ways that plants and animals meet their needs. Students care for plants to learn what they need to grow and develop. They observe the structures of plants and discover ways to propagate new plants from mature plants (from seeds, bulbs, roots, and stem cuttings). They observe and describe changes that occur as plants grow, and organize their observations on a calendar and in a notebook. They build a terrarium and provide for the needs of both plants and animals living together in a classroom habitat. They read about and view photographs and videos of plants and animals living in different habitats.

Unit 4 - Earth’s Place in the Universe
Unit 4 March-April

Unit 4 Overview
In the previous Light and Sound module, students explored how light and sound travel over distances. The primary source of light on Earth is the Sun. The Sun is the star at the center of our solar system. Students will learn that stars, including the Sun, generate their own light, while objects such as the moon reflect that light.

Throughout the module students will document patterns as they observe the Sun, moon, and stars. The ability to recognize patterns is an important scientific skill that researchers use to develop explanations of observations in nature.

Finally, students will be challenged with the task of designing, building, and testing device to protect students from ultraviolet (UV) radiation. Students will analyze media to determine the peak times during the day for UV radiation and then design a cover for playground structure.

Essential Questions
- How will you be able to observe, describe, and predict patterns of motion of the sun, moon, and stars in the sky?
- How can you observe, describe, and predict patterns of the sunrise and sunset?
**Essential Learning Outcomes**

- Students will be able to use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
- Students will be able to understand how to make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

**Technology Infusion**

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**Standards Addressed:**

*Earth Science:*

1-ESS1-1:
- ESS1.A

1-ESS1-2:
- ESS1.B

**Differentiation**

- Mixed ability grouping to ensure the success of all the students
- Writing assignments and expectations varied based on student’s ability
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- Leveled nonfiction books
- Activities and experiments aimed to provide opportunities for students to utilize their strengths and appeal to individual interests
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- Small group and Independent learning activities with expectations based on the student or group’s ability.
- Use of computers as an aide for writing projects and research

**Assessments**

- Class participation
- Completion of activity sheets
- Discussions demonstrating knowledge of subject matter
- Interactive journal responses
- Responses
- Academic Vocabulary

**21st Century Learning Connection**
Students can use the 5th Grade PLTW modules which consists of investigations, each designed to introduce concepts in earth science. The investigations provide opportunities for young students to explore the natural world by using simple tools to observe and monitor change. Students will have the opportunity to observe the location of the Sun and the Moon in the sky over a day and the change in the appearance of the Moon over a month, as well as various other engaging earth science investigations.

Unit 5 – Computer Science: Animated Story Telling
Unit 5 May-June

Unit 5 Overview
In this module students will develop the ability to create digital animated stories on a tablet. Students will explore the sequential nature of computer programs through hands-on activities both with and without a computer. Applying skills and knowledge learned from activities in this module, students will work in pairs to design and program a simple digital animated story that interacts with the reader.

Essential Questions
- How do I construct a set of statements that will provide the computer with step-by-step instructions for displaying a story?
- How does technology let me do that I can't do without using technology?
- How can strategies that I use help so that I don’t become frustrated if my program isn't working right?

Essential Learning Outcomes
- Students will be able to define a program as instructions written in a language that a computer can follow.
- Students will be able to identify characteristics of digital artifacts that cannot be accomplished with non-digital tools. Characteristics include sound, pictures, moving pictures, and the ability to interact with the user.
- Students will be able to explore the notion that describing information that comes from a computer through its output interfaces makes a difference in the outcome.
- Students will be able to recall that programming often requires going through the design process many times to test and fix the program.

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Standards Addressed:
Engineering Design
K-2-ETS1-1 K-2-ETS1-2 K-2-ETS1-3
Differentiation

- Mixed ability grouping to ensure the success of all the students
- Writing assignments and expectations varied based on student’s ability
- Organizers to provide guidance on writing tasks
- Leveled nonfiction books
- Activities and experiments aimed to provide opportunities for students to utilize their strengths and appeal to individual interests
- Small group and individual guidance and support
- Small group and Independent learning activities with expectations based on the student or group’s ability.
- Use of computers as an aide for writing projects and research

Assessments

- Class participation
- Completion of activity sheets
- Discussions demonstrating knowledge of subject matter
- Interactive journal responses
- Responses
- Academic Vocabulary

21st Century Learning Connection

Problem Solving: Have students work alone or in groups to design a new tool to help them in their everyday lives. Have students identify the tool they want to design, think about the parts they will need, draw a picture of their design, and label the parts. Provide students with a variety of classroom materials, such as paper, crayons, tape, pipe cleaners, etc. to develop this tool and tell students to use the materials to develop the invention that they will present to the class. Finally, students will write about their invention. Have students present their designs/creations to the class, while the audience identifies the strengths and weaknesses of each invention and its main function.