Hoboken Public Schools

Science Curriculum
Grade 5

Science Grade 5

HOBOKEN PUBLIC SCHOOLS

Course Description

Based on the Next Generation Science Standards and the New Jersey Learning Standards for Science: Performance ExpectationsNew Jersey Learning Standards for Science: Performance Expectations, the Hoboken Public School's fifth grade science program is designed to introduce and develop a foundation in science through six major units of study. Lessons are taught with concrete, hands-on activities that allow science experiences to leave lasting impressions.

Students are able to describe that matter is made of particles too small to be seen through the development of a model. Students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. Through the development of a model using an example, students are able to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. They describe and graph data to provide evidence about the distribution of water on Earth. Students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment and that energy in animals' food was once energy from the sun. Students are expected to develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Crosscutting Concepts:

- patterns
- cause and effect
- energy and matter
- systems and system models
- interdependence of science, engineering, and technology
- influence of STEM on society and the natural world

Furthermore, fifth grade students are expected to work through the engineering design process to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information.

At this level students will be exposed to the New Jersey Student Learning Assessment for Science (NJSLA-S) which measures student proficiency with the New Jersey Student Learning Standards for Science. The science standards require assessment tasks that examine students' performance of scientific and engineering practices in the context of crosscutting concepts and disciplinary core ideas. The three-dimensional nature of the standards requires more complex assessment items and tasks. The NJSLA is only one component of a system of assessments that provide evidence about student learning. The data collected from the NJSLA-S, students' interactions with teachers on a daily basis, and their subsequent performance on teacher and district developed assessments combine to provide a clear and well-rounded picture of students' achievement. Please visit the website for detailed information regarding testing dates, practice tests, and further information regarding the assessment.

Interdisciplinary Connections

The science curriculum includes unifying themes such as systems, changes, and models. These themes combine with connected skills such as using measurement and representations. These themes and skills, along with the shared processes of observing and predicting, provide teachers with a myriad of opportunities for making meaningful curricular connections across disciplines.

For example, investigations of local issues can engage students in thinking about science and social science concepts and help develop their understanding of probability and data analysis, which are parts of the mathematics standards. Learning, understanding, and using scientific vocabulary allows students to attach their ideas to content-specific words and phrases. Students must understand the appropriate levels of scientific terminology to be able to meet the lesson objectives. In addition, teachers may use journals, night writes, lab reports and outlines to provide students with opportunities to write in the science classroom.

Additional Resources

- New Jersey Student Learning Standards - Science
- Project Lead The Way (PLTW) Launch Curriculum
- New Jersey Student Learning Standard 8 - 8.1 Computer Science
- New Jersey Student Learning Standard 9 - Career Readiness, Life Literacies and Key Skills
- New Jersey Student Learning Standards-Climate Change Education
- Science Dimensions Curriculum
- Generation Genius
- **Night Writes:** CommonLit, Newsela**,** or other district approved resource

Pacing Guide

	Month	Unit Title	NGSS	Resources
1	September	Engineering & Technology	3-5 ETS1-1 3.5 ETS1-2 3-5-ETS1-3	Science Dimensions
2	September-October	Unit 2 Matter	5-PS1-1 5-PS1-2 5-PS1-3 5-PS1-4	Science Dimensions
3	October-November	Unit 3 & Unit 4:Energy and Matter in Organisms & Ecosystems	5-LS1-1 5-PS3-1 5-LS2-1	Science Dimensions
4	November-December	Unit 5 Systems in Space	5-PS2-1 5-ESS1-1 5-ESS1-2	Science Dimensions
5	December-January	Unit 6 Earth's Systems	5-ESS2-1 5-ESS2-2 5-PS2-1	Science Dimensions

6	January-February	Unit 7 Earth and Human Activities	5-ESS3-1	Science Dimensions
7	February-March	Robotics and Automation	3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3	**PLTW**
8	April-May	Infection: Detection	3-5 ETS1-1 3.5 ETS1-2 3-5-ETS1-3	**PLTW**
9	May-June	Infection: Modeling and Simulation	3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3	**PLTW**

1. Unit 1: Engineering & Technology
Timeframe: September

2. Unit 2 - Matter
Timeframe: September-October

Overview
In this unit, students will…

- discover the different states of matter and how to measure matter
- explore the different properties of matter along with dissolving rates of certain matter
- compare and contrast physical and chemical changes of matter

Essential Questions

- What is matter?
- What are the properties of matter?
- How does matter change?

Learning Objectives

- Recognize that all objects are made of tiny particles of matter too small to be seen.
- Identify solids, liquids, and gasses as states of matter.
- Demonstrate through investigations how to measure matter, including measuring length, weight, and volume.
- Explore properties of matter and compare substances based on their physical properties.
- Recognize factors affecting properties of matter.
- Identify mixtures and solutions and relate the properties of mixtures with the properties of starting materials.
- Recognize a variety of physical and chemical changes and the differences between them.
- Learn about the conservation of matter.

Standards Addressed

- 5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen
- 5-PS1-2 Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved
- 5-PS1-3 Make observations and measurements to identify materials based on their properties
- 5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Disciplinary Core Ideas

- **PS1.A: Structure and Properties of Matter** Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1-1) The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2) Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)
- **PS1.B: Chemical Reactions** When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4) No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)

Crosscutting Concepts

- **Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4)
- **Scale, Proportion, and Quantity** Natural objects exist from the very small to the immensely large. (5- PS1-1) Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2), (5-PS1-3)
- **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** Science assumes consistent patterns in natural systems. (5- PS1-2)

Integrated Accommodations and Modifications

- **Special Education Students**
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
    - Extended time for revisions or opportunity to identify and develop areas of personal interest.
    - Unique Learning System enables educators in self-contained classes to deliver differentiated, standards-aligned content from one convenient, cloud-based platform enhanced by robust assessments, data tools, and evidence-based instructional support. Students from pre-K through transition have the advantage of consistent, high-quality instruction, a motivating interactive learning environment, engaging symbol support, and a path to independence.
- **English Language Learners**
    - Invite students to explore different points of view on a topic of study and compare.
    - Translated literature on tape.
- **Skills Fragile Students**

    - Encourage students to make transformations - use a common task or item in a different way.
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
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- **504 Students**
    - Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment.
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    - Extended time for revisions or opportunity to identify and develop areas of personal interest.
- **Gifted & Talented Students**
    - Encourage students to explore concepts in-depth and encourage independent studies or investigations.
    - Modeling or independent student-led research

Assessments

- Formal Assessments and/or Quizzes
- Benchmark Unit Labs
- Multimedia Presentations
- Journal Writing Prompts
- Vocabulary
- Class Participation
- Analysis of Student Work
- Project-Based Assignments

Integration of NJSLS Standard 9: Career Readiness Life Literacies and Key Skills

- 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions
- 9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue.
- 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity
- 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity
- 9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process
- 9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem
- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.
- 9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global

- 9.4.5.GCA.1: Analyze how culture shapes individual and community perspectives and points of view
- 9.4.5.IML.2: Create a visual representation to organize information about a problem or issue
- 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data

3. Unit 3 & Unit 4 - Energy and Matter in Organisms & Ecosystems
Timeframe: October-November

Overview
In this unit, students will…
- investigate how living organisms get energy
- explore how living organisms use energy and how they interact in their environments

Essential Questions
- How does energy get transformed by plants?
- How do organisms use matter and energy?
- How do organisms interact?

Learning Objectives
- Develop and use models to support an argument that plants acquire materials for growth mainly from air and water.
- Understand that animals need food for the materials necessary for body growth and repair and that they obtain gasses and water from the environment and release waste matter back into the environment.
- Develop and use models to explore how organisms interact and survive in environments where their needs are met.

Standards Addressed
- 5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water
- 5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun
- 5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Disciplinary Core Ideas
- **LS1.C: Organization for Matter and Energy Flow in Organisms** Plants acquire their material for growth chiefly from air and water. (5-LS1-1)
- **PS3.D: Energy in Chemical Processes and Everyday Life** The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5- PS3-1)
- **LS1.C: Organization for Matter and Energy Flow in Organisms** Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1)

- **LS2.A: Interdependent Relationships in Ecosystems** The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2- 1)
- **LS2.B: Cycles of Matter and Energy Transfer in Ecosystems** Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)

Crosscutting Concepts

- **Energy and Matter** Matter is transported into, out of, and within systems. (5-LS1-1)
- **Energy and Matter** Energy can be transferred in various ways and between objects. (5-PS3-1)
- **Systems and System Models** A system can be described in terms of its components and their interactions. (5-LS2-1)
- **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** Science explanations describe the mechanisms for natural events. (5- LS2-1)

Integrated Accommodations and Modifications

- **Special Education Students**
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
    - Extended time for revisions or opportunity to identify and develop areas of personal interest.
    - Unique Learning System enables educators in self-contained classes to deliver differentiated, standards-aligned content from one convenient, cloud-based platform enhanced by robust assessments, data tools, and evidence-based instructional support. Students from pre-K through transition have the advantage of consistent, high-quality instruction, a motivating interactive learning environment, engaging symbol support, and a path to independence.
- **English Language Learners**
    - Invite students to explore different points of view on a topic of study and compare.
    - Translated literature on tape.
- **Skills Fragile Students**
    - Encourage students to make transformations - use a common task or item in a different way.
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
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- **Gifted & Talented Students**
    - Encourage students to explore concepts in-depth and encourage independent studies or investigations.
    - Modeling or independent student-led research

Assessments

- Formal Assessments and/or Quizzes
- Benchmark Unit Labs
- Multimedia Presentations
- Journal Writing Prompts
- Vocabulary
- Class Participation
- Analysis of Student Work
- Project-Based Assignments

Integration of NJSLS Standard 9: Career Readiness Life Literacies and Key Skills

- 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions
- 9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue.
- 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity
- 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity
- 9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process
- 9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem
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- 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data

4. Unit 5 - Systems in Space

Timeframe: November-December

Overview

In this unit, students will…

- use evidence to explain that Earth's orbit and the Earth's rotation cause predictable patterns
- explain why the sun appears to large and bright from Earth
- explain that Earth is a sphere and that gravity pulls objects toward Earth's center

Essential Questions

- How does gravity affect matter on Earth?
- What daily patterns can be observed?
- What patterns can be observed in a year?
- What is the Sun?

Learning Objectives

- Gather evidence to explain that the gravity of Earth pulls objects toward the planet's center.
- Through the development and use of models, students will use evidence to explain that Earth is a sphere and that gravity causes objects to move toward Earth's center.
- Explore daily patterns caused by interactions of bodies in the solar system.
- Collect and analyze data to detect patterns, including the path of the sun across the day sky and constellations in the night sky.
- Gather evidence to explain how Earth orbits around the sun and the moon orbits around Earth.
- Through the collection and analysis of data, students will use evidence to explain that Earth's orbit and the moon's orbit cause predictable patterns.
- Learn that the sun appears larger and brighter than other stars due to its distance from Earth through models that show scale, proportion, and quantity.

Standards Addressed

- 5-PS2-1 Support an argument that the gravitational force exerted by Earth on Objects is directed down
- 5-ESS1-1 Support an argument that differences in the apparent brightness of the sun compared to other stars are due to their relative distances from Earth
- 5-ESS1-2 Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky

Disciplinary Core Ideas

- **PS2.B: Types of Interactions** The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1)
- **ESS1.A: The Universe and its Stars** The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1)
- **ESS1.B: Earth and the Solar System** The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5- ESS1-2)

Crosscutting Concepts

- **Cause and Effect** Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1)
- **Patterns** Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2)
- **Scale, Proportion, and Quantity** Natural objects exist from the very small to the immensely large. (5- ESS1-1)

Integrated Accommodations and Modifications

- **Special Education Students**
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
    - Extended time for revisions or opportunity to identify and develop areas of personal interest.
    - Unique Learning System enables educators in self-contained classes to deliver differentiated, standards-aligned content from one convenient, cloud-based platform enhanced by robust assessments, data tools, and evidence-based instructional support. Students from pre-K through transition have the advantage of consistent, high-quality instruction, a motivating interactive learning environment, engaging symbol support, and a path to independence.
- **English Language Learners**
    - Invite students to explore different points of view on a topic of study and compare.
    - Translated literature on tape.
- **Skills Fragile Students**
    - Encourage students to make transformations - use a common task or item in a different way.
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
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- **504 Students**
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- **Gifted & Talented Students**
    - Encourage students to explore concepts in-depth and encourage independent studies or investigations.
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Assessments

- Formal Assessments and/or Quizzes
- Benchmark Unit Labs
- Multimedia Presentations
- Journal Writing Prompts
- Vocabulary
- Class Participation

- Analysis of Student Work
- Project-Based Assignments

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- 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions
- 9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue.
- 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity
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- 9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process
- 9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem
- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.
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- 9.4.5.GCA.1: Analyze how culture shapes individual and community perspectives and points of view
- 9.4.5.IML.2: Create a visual representation to organize information about a problem or issue
- 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data

5. Unit 6 - Earth's Systems

Timeframe: December-January

Overview

In this unit, students will…

- explore the hydrosphere, geosphere, biosphere, and atmosphere
- learn how Earth's systems interact

Essential Questions

- What are Earth's major systems?
- How do Earth's systems interact?
- What is the role of the oceans in Earth's systems?

Learning Objectives

- Identify and describe each of Earth's systems and the cycles that occur within them.
- Develop and use models to investigate how Earth's systems interact.
- Observe and describe the distribution of water on Earth and explore the effects of the oceans on landforms, climates, and ecosystems.

Standards Addressed

- 5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact
- 5-ESS2-2 Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth
- 5-PS2-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.

Disciplinary Core Ideas

- **ESS2.A: Earth Materials and Systems** Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1)
- **ESS2.C: The Roles of Water in Earth's Surface Processes** Nearly all of Earth's available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2)
- **PS2.B: Types of Interactions** The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1)

Crosscutting Concepts

- **Scale, Proportion, and Quantity** Standard units are used to measure and describe physical quantities such as weight and volume. (5- ESS2-2)
- **Systems and System Models** A system can be described in terms of its components and their interactions. (5-ESS2-1)
- **Cause and Effect** Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1)

Integrated Accommodations and Modifications

- **Special Education Students**
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
    - Extended time for revisions or opportunity to identify and develop areas of personal interest.
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Assessments

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Integration of NJSLS Standard 9: Career Readiness Life Literacies and Key Skills

- 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions
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- 9.4.5.GCA.1: Analyze how culture shapes individual and community perspectives and points of view
- 9.4.5.IML.2: Create a visual representation to organize information about a problem or issue
- 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data

6. Unit 7 - Earth and Human Activities
Timeframe: January-February

Overview
In this unit, students will…
- explore how human activity affects the Earth and its systems
- learn about ways to keep Earth and its systems healthy

Essential Questions
- How does resource use affect Earth?
- How can people protect the environment?

Learning Objectives
- Recognize and explain how people affect Earth's resources.
- Obtain, evaluate, and communicate information about the importance of reducing, reusing, and recycling and other ways people protect the environment.
- Investigate technologies and ideas used to help protect Earth's resources and environments.

Standards Addressed
- 5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources, environment, and address **climate change** issues. Lesson Plan (substitute paint for color pencils/crayons)

Disciplinary Core Ideas
- **ESS3.C: Human Impacts on Earth Systems** Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

Crosscutting Concepts
- **Systems and System Models** A system can be described in terms of its components and their interactions. (5-ESS3-1)
- **Science Addresses Questions About the Natural and Material World** Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3- 1)

Integrated Accommodations and Modifications
- **Special Education Students**
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    - Unique Learning System enables educators in self-contained classes to deliver differentiated, standards-aligned content from one convenient, cloud-based platform enhanced by robust assessments, data tools, and evidence-based instructional support. Students from pre-K through transition have the advantage of consistent, high-quality instruction, a motivating interactive learning environment, engaging symbol support, and a path to independence.
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    - Extended time for revisions or opportunity to identify and develop areas of personal interest.
- **504 Students**
    - Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment.
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- **Gifted & Talented Students**
    - Encourage students to explore concepts in-depth and encourage independent studies or investigations.
    - Modeling or independent student-led research

Assessments

- Formal Assessments and/or Quizzes
- Benchmark Unit Labs
- Multimedia Presentations
- Journal Writing Prompts
- Vocabulary
- Class Participation
- Analysis of Student Work
- Project-Based Assignments

Integration of NJSLS Standard 9: Career Readiness Life Literacies and Key Skills

- 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions
- 9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue.

- 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity
- 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity
- 9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process
- 9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem
- 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.
- 9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global
- 9.4.5.GCA.1: Analyze how culture shapes individual and community perspectives and points of view
- 9.4.5.IML.2: Create a visual representation to organize information about a problem or issue
- 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data

7. PLTW Robotics and Automation
Timeframe: February-March

Overview
In this module students explore robotic history and learn more about a particular type of robot. The activities and projects in this module will develop skills and knowledge associated with robotics and the use of VEX® IQ equipment. Additionally, students explore the application of autonomous robots in a variety of situations and learn more about a particular type of robot. The activities and projects in this module will develop skills and knowledge associated with the utilization of computer software to program robots.

Essential Questions
- How can automation and robotics be used to protect the Earth's resources and environment?
- How can the engineering design process be applied in daily life?
- How can autonomous robots be used to help people?

Learning Objectives
- Explain what happens at each step of the design process.
- State questions engineers may ask when gathering information about a situation people may want to change.
- Identify the differences between invention and innovation.
- Identify applications of robot technology used to complete dangerous tasks.
- Identify inputs and outputs within a robotic system.

Standards Addressed
- 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

- 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Disciplinary Core Ideas

- **ETS1.A: Defining and Delimiting Engineering Problems** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1)
- **ETS1.B: Developing Possible Solutions** Research on a problem, such as climate change, should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2) At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2) Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5- ETS1-3)
- **ETS1.C: Optimizing the Design Solution** Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)

Crosscutting Concepts

- **Influence of Engineering, Technology, and Science on Society and the Natural World** People's needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1) Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

Integrated Accommodations and Modifications

- **Special Education Students**
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
    - Extended time for revisions or opportunity to identify and develop areas of personal interest.
    - Unique Learning System enables educators in self-contained classes to deliver differentiated, standards-aligned content from one convenient, cloud-based platform enhanced by robust assessments, data tools, and evidence-based instructional support. Students from pre-K through transition have the advantage of consistent, high-quality instruction, a motivating interactive learning environment, engaging symbol support, and a path to independence.
- **English Language Learners**
    - Invite students to explore different points of view on a topic of study and compare.
    - Translated literature on tape.
- **Skills Fragile Students**
    - Encourage students to make transformations - use a common task or item in a different way.
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.

    - Extended time for revisions or opportunity to identify and develop areas of personal interest.
- **504 Students**
    - Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment.
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
    - Extended time for revisions or opportunity to identify and develop areas of personal interest.
- **Gifted & Talented Students**
    - Encourage students to explore concepts in-depth and encourage independent studies or investigations.
    - Modeling or independent student-led research

Assessments

- Formal Assessments and/or Quizzes
- Benchmark Unit Labs
- Multimedia Presentations
- Journal Writing Prompts
- Vocabulary
- Class Participation
- Analysis of Student Work
- Project-Based Assignments

NJSLS 8.1 Computer Science

- 8.1.5.CS.1: Model how computing devices connect to other components to form a system.
- 8.1.5.CS.2: Model how computer software and hardware work together as a system to accomplish tasks.
- 8.1.5.CS.3: Identify potential solutions for simple hardware and software problems using common troubleshooting strategies.
- 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe the factors that influenced the changes.
- 8.1.5.DA.5: Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
- 8.1.5.AP.1: Compare and refine multiple algorithms for the same task and determine which is the most appropriate.

Integration of NJSLS Standard 9: Career Readiness Life Literacies and Key Skills

- 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions
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- 9.4.5.GCA.1: Analyze how culture shapes individual and community perspectives and points of view
- 9.4.5.IML.2: Create a visual representation to organize information about a problem or issue
- 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data

8. PLTW - Infection: Detection
Timeframe: April-May

Overview
Students learn about transmission of disease through a simulation and compare communicable and non-communicable diseases. Students design, run, and analyze data from an experiment related to preventing the spread of germs. Student groups present ways to prevent the spread of infection using evidence from their experiments. Students investigate how the body protects us from these germs to keep us healthy. Bacteria and viruses are introduced as agents of disease, and students use information learned and patient symptoms to identify the disease agent causing a simulated disease outbreak. Using epidemiology practices, students deduce a likely source of an infection that is spreading through a fictional school.

Essential Questions
- How can germs spread from person to person?
- How does the body defend itself from infectious disease?
- How can medical professionals use patient symptoms to diagnose illness?
- How can scientists determine how a germ spreads through a group of people?

Learning Objectives
- Recognize that germs can make a person sick.
- Recognize that bacteria and viruses are germs.
- Describe the various ways germs can be passed from person to person.
- Recognize that bacteria and viruses are microscopic in size and that they cannot be seen with the naked eye.
- Identify the ways that the body protects and defends itself against infection.
- Identify behaviors that promote good health.

Standards Addressed

- 3-5 ETS1-1 Define a simple problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- 3-5 ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Disciplinary Core Ideas

- **ETS1.A: Defining and Delimiting Engineering Problems** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1)
- **ETS1.B: Developing Possible Solutions** Research on a problem, such as climate change, should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2) At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2) Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5- ETS1-3)
- **ETS1.C: Optimizing the Design Solution** Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)

Crosscutting Concepts

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Integrated Accommodations and Modifications

- **Special Education Students**
    - Provide graphic organizers for additional support or encourage students to create digital multimedia to showcase knowledge.
    - Extended time for revisions or opportunity to identify and develop areas of personal interest.
    - Unique Learning System enables educators in self-contained classes to deliver differentiated, standards-aligned content from one convenient, cloud-based platform enhanced by robust assessments, data tools, and evidence-based instructional support. Students from pre-K through transition have the advantage of consistent, high-quality instruction, a motivating interactive learning environment, engaging symbol support, and a path to independence.
- **English Language Learners**
    - Invite students to explore different points of view on a topic of study and compare.
    - Translated literature on tape.
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Assessments

- Formal Assessments and/or Quizzes
- Benchmark Unit Labs
- Multimedia Presentations
- Journal Writing Prompts
- Vocabulary
- Class Participation
- Analysis of Student Work
- Project-Based Assignments

NJSLS 8.1 Computer Science

- 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.
- 8.1.5.DA.3: Organize and present collected data visually to communicate insights gained from different views of the data.
- 8.1.5.DA.4: Organize and present climate change data visually to highlight relationships or support a claim.
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Integration of NJSLS Standard 9: Career Readiness Life Literacies and Key Skills

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- 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data

9. PLTW - Infection: Modeling and Simulation
Timeframe: May-June

Overview
This module invites students to discover how modeling and simulation provide powerful insight into complex systems. As they engage in building their own simple computer models, they come to understand the indispensable role computers play in helping scientists study systems through modeling and simulation.

Essential Questions
- How does technology help us to make sense of scientific phenomena?
- Why is it helpful to be able to approximate a system with a computer model?

Learning Objectives
- Identify the agents and parameters in a simple system.
- Explain that changing a parameter while running a simulation uncovers how the parameter affects the model system.
- Identify parts of a computational solution that can be abstracted and modularized in order to make the solution efficient and generalizable.
- Identify events that drive a program's behavior such as external user interaction and internal variable counters.
- Explain in simple terms how to clone an object to make a variable number of copies as determined at program runtime.

Standards Addressed
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- 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

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- 8.1.5.DA.5: Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
- 8.1.5.AP.1: Compare and refine multiple algorithms for the same task and determine which is the most appropriate.
- 8.1.5.AP.2: Create programs that use clearly named variables to store and modify data.
- 8.1.5.AP.3: Create programs that include sequences, events, loops, and conditionals
- 8.1.5.AP.4: Break down problems into smaller, manageable sub-problems to facilitate program development.
- 8.1.5.AP.5: Modify, remix, or incorporate pieces of existing programs into one's own work to add additional features or create a new program.
- 8.1.5.AP.6: Develop programs using an iterative process, implement the program design, and test the program to ensure it works as intended.

Integration of NJSLS Standard 9: Career Readiness Life Literacies and Key Skills

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