## Grade 4

## Energy and Waves

**NGSS Performance Expectations**

**Students who demonstrate understanding can:**

| | |
|---|---|
| 4-PS3-1 | Use evidence to construct an explanation relating the speed of an object to the energy of that object. |
| 4-PS3-2 | Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat and electric currents. |
| 4-PS3-3 | Ask questions and predict outcomes about the changes in energy that occur when objects collide. |
| 4-PS3-4 | Apply scientific ideas to design, test and refine a device that converts energy from one form to another. |
| 4.PS4-1 | Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. |
| 4.PS4-2 | Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. |
| 4.PS4-3 | Generate and compare multiple solutions that use patterns to transfer information. |

| PS3.A: Definition of Energy | Student Learning Objectives | Suggested Assessments |
|---|---|---|
| • The faster a given object is moving, the more energy it possesses.<br>• Energy can be moved from place to place by moving objects or through sound, light, or electric currents.<br><br>**PS3.B: Conservation of Energy and Energy Transfer**<br><br>• Energy is present wherever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.<br>• Light also transfers energy from place to place. | • Students explore energy.<br>• Students investigate how energy is stored, how it can make objects move, and how collisions transfer energy between objects.<br>• Students also construct devices that convert energy from one form into another, such as heat into motion and electricity into light.<br>• Students generate observations and questions about the phenomenon and create an initial conceptual model to explain what is happening. (4-PS3-1, 4-PS3-2, 4-PS3-3, 4-PS3-4)<br>• Students learn that we use the energy from food to make our bodies move just like cars use the energy from gasoline to move.<br>• Students build paper models of an amusement park ride. The ride stores energy in rubber bands and spins around when the energy is released. | **Ongoing Assessments**<br>• Science notebook<br>• Lab/Response sheets<br>• Participation/Performance assessment<br>**Formative Assessments**<br>• Individual lesson assessments<br>**Summative Assessments**<br>• Unit Test<br>• Performance Task |

| | | |
|---|---|---|
| • Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.<br>**PS3.C: Relationship Between Energy and Forces**<br>• When objects collide, the contact forces transfer energy so as to change the objects' motion.<br>**PS3.D: Energy in Chemical Processes and Everyday Life**<br>• The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use.<br>**ETS1.A: Defining Engineering Problems**<br>• 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 or how well each takes the constraints into account.<br>**PS4.A: Wave Properties**<br>• Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface in deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach.<br>• Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). | • Students compare the speed of the spins when they use a thin rubber band versus a thick rubber band. (4-PS3-1, 4-PS3-4)<br>• Students explore how energy can be stored as height.<br>• Students build paper roller coasters.<br>• Students release marbles down the roller coaster track to understand height energy and energy transfer *(4-PS3-1, 4-PS3-3).*<br>• Students will explore how high the hills of a roller coaster can be.<br>• Students add hills to the Bumper Coaster they built in the previous experiment and build a deeper understanding of hills and energy. *(4-PS3-1, 4-PS3-3)*<br>• Students construct an explanation of how energy is stored, released, and transferred in chain reactions, such as falling dominoes.<br>• Students Build a Chain Reaction (Part I), students are presented with an engineering design challenge to create their own chain reaction machine.<br>• Students experiment with a "Chain-Reaction Starter Kit." This kit includes a lever and a ramp, which serve as the first two steps of a chain-reaction machine*(4-PS3-4, 3-5-ETS1-1).*<br>• Students learn about storing, releasing, and transferring energy. In the activity, Build a Chain, Students complete the chain-reaction machine they started building in the previous lesson. *(*4-PS3-4, 3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3)<br>• Students are introduced to electricity as a form of energy.<br>• Students investigate how electrical energy requires a circuit and make their own mini flashlights from LEDs, button batteries, and strips of aluminum foil. Along the way, they'll learn about the anatomy of a battery, begin to see how circuits work, and discover how handy an on-off switch can be. *(4-PS3-2, 4-PS3-4)* | |

| | | |
|---|---|---|
| **PS4.B: Electromagnetic Radiation**<br>• An object can be seen when light reflected from its surface enters the eyes.<br>**PS4.C: Information Technology**<br>• Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information -- convert it from digitized form to voice-- and vice versa.<br>**ETS1.C: Optimizing the Design Solution**<br>• Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. | • Students explore how heat is another form of energy that can make things go.<br>• Students first make a paper Heat Spinner and observe how air can create movement. Then, students use their Heat Spinners to experiment with a heat source (an incandescent bulb) and discover how heat energy can make the spinner move in different ways. *(4-PS3-2, 4-PS3-4)*<br>• Students construct physical devices to feel the vibrations that allow us to communicate across distances. Students also use digital devices to visualize the characteristics of different sound waves that cause us to hear different things.<br>• Students generate observations and questions about the phenomenon and create an initial conceptual model to explain what is happening. *(4-PS4-1)*<br>• Students learn about the connection between sounds and vibration.<br>• Students make telephones using cups and string.<br>• Students then modify the design of their telephones using different types of supplies to see if they can improve the sound quality. *(4-PS4-1, 4-PS4-3)*<br>• Students explore the role that air plays in enabling a sound vibration to travel.<br>• Students do two short activities that explore sound vibrations.<br>• Students experiment with sound to understand how it moves through the air and then consider what would happen in an environment like space where there is no air. *(4-PS4-1)*<br>• Students discover that sound is a wave.<br>• Students draw the waves that different sounds make using a virtual oscilloscope, a machine that shows images of sound waves. Then they vibrate a rope to make waves that look like the ones made by the oscilloscope. *(4-PS4-1)*<br>• In this unit, students investigate structures and | |

| | | |
|---|---|---|
| | functions of the human body. Students explore how our bones and muscles are interconnected, how our eyes interact with light and impact our vision, and how our brain responds to stimuli in our environment.<br>• Students generate observations and questions about the phenomenon and create an initial model to explain how the owl's body systems work together to catch prey. *(4-PS4-2, 4-LS1-1, 4-LS1-2)*<br>• Students discover the basics of how their eyes work, and figure out some of the causes of vision problems. In the activity, Eye Model, students develop a working model of a human eye. They use a magnifying lens as a model of the cornea to explore how the structure of this lens is related to the function of our eyes. *(4-PS4-2, 4-LS1-1, 4-LS1-2)*<br>• Students delve further into the workings of the eye, exploring the function of their iris and pupil.<br>• Students add a smaller pupil to the eye model that they created in the previous lesson. Then they observe how the changing size of the pupil controls how much light enters the eye. *(4-PS4-2, 4-LS1-1, 4-LS1-2)* | |

| Science and Engineering Practices | Crosscutting Concepts |
|---|---|
| • Asking questions and defining problems<br>• Developing and using models<br>• Planning and carrying out investigations<br>• Analyzing and interpreting data<br>• Using mathematics and computational thinking<br>• Constructing explanations and designing solutions<br>• Engaging in argument from evidence<br>• Obtaining, evaluating, and communicating Information<br><br>***Connections to Nature of Science***<br>**Scientific Knowledge is Based on Empirical Evidence** | • Patterns<br>• Cause and effect<br>• Systems and system models<br>• Energy and matter<br>***Connections to Engineering, Technology and Applications of Science***<br>**Influence of Engineering, Technology and Science on Society and the Natural World**<br>• Engineers improve existing technologies or develop new ones.<br>**Interdependence of Science, Engineering and Technology**<br>• Knowledge and relevant scientific concepts and research findings are important in engineering. |

| | |
|---|---|
| • Science findings are based on recognizing patterns. | ***Connections to Nature of Science***<br>**Science is a Human Endeavor**<br>• Most scientists and engineers work in teams.<br>• Science affects everyday life. |

**Interdisciplinary Connections**

**ELA:** Throughout research and integration of science practices students read leveled texts to gain additional information.

- Students participate in discussion and partnerships to gain further information on various scientific topics.
- RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS3-1)
- RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4-PS3-1)
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS3-1)
- W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4- PS3-1)
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-2), (4-PS3-3), (4-PS3-4)
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information and provide a list of sources. (4-PS3-1), (4-PS3-2), (4- PS3-3), (4-PS3-4)
- W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4- PS3-1)
- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-1), (4-PS4-2)

**Mathematics:** Through Science labs students are required to incorporate the following math standards in order to accurately complete the various tasks related to science:

- 4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (4-PS3-4)
- MP.4 Model with mathematics. (4-PS4-1), (4-PS4-2)

**21st Century Life and Careers - Technology (link to standard 8.1 and 8.2) / Career and 21st Century Skills (link to standard 9.1, 9.2, 9.4)**
**(Include standard number and activity examples from each area):**

**Computer Science and Design Thinking**

- **8.1 Computer Science**
  - 8.1 Data and Analysis
    - 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.
  - Effects of Technology on the Natural World
    - 8.2.5.ETW.4: Explain the impact that resources, such as energy and materials used to develop technology, have on the environment.

**Computer Science and Design Thinking**

- 8.2 Design Thinking
  - Engineering Design
    - 8.2.5.ED.1 - Explain the functions of a system and its subsystems.
    - 8.2.5.ED.2 - Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
    - 8.2.5.ED.3 - Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
    - 8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
    - 8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process.
    - 8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and tradeoffs identified in the design process.

**Career and 21st Century Skills**

- 9.2 Career Awareness, Preparation, and Training
  - Career Awareness and Planning
    - 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
    - 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
- 9.4 Life Literacies and Key Skills
  - Creativity and Innovation
    - 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.
  - Critical Thinking and Problem-Solving
    - 9.4.5.CT.1 - Identify and gather relevant data that will aid in the problem-solving process.

        - 9.4.5.CT.4 - Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global.
    - Global and Cultural Awareness
        - 9.4.5.IML.7 - Evaluate the degree to which information meets a need including social emotional learning, academic, and social.
    - Information and Media Literacy
        - 9.4.5.IML.2 - Create a visual representation to organize information about a problem or issue.
        - 9.4.5.IML.6 - Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions.

- **CRP1. Act as a responsible and contributing citizen and employee. Example:** Students will develop understanding and value of the importance of making contributions to classroom discussions to support the learning community.
- **CRP4. Communicate clearly and effectively and with reason.** Example: Students will learn and apply classroom protocols that support clear and effective communication to express, refine, and critique mathematical reasoning.
- **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them:** Students will understand the expectation that true mathematical problems require a strong perseverance to develop partial or complete solutions. Classroom communication strategies and routines will support student transfer of critical thinking skills.
- **2- Digital Citizenship:** Students recognize the rights, responsibilities, and opportunity of learning, living and working in an interconnected digital world and they act and model in ways that are safe, legal and ethical. Students use Chromebooks to explore online resources and complete differentiated assignments.

**Warren QSAC Accommodations Chart**

**Available Resources**
www.brainpop.com
www.nsta.org

**Unit Summary:**
In this unit, students explore energy! Students investigate how energy is stored, how it can make objects move, and how collisions transfer energy between objects. Students also construct devices that convert energy from one form into another, such as heat into motion and electricity into light.

In this unit, students investigate the science of sound. Students construct physical devices to feel the vibrations that allow us to communicate across distances. Students also use digital devices to visualize the characteristics of different sound waves that cause us to hear different things.

In this unit, students investigate structures and functions of the human body. Students explore how our bones and muscles are interconnected, how our eyes interact with light and impact our vision, and how our brain responds to stimuli in our environment.

**Prior Knowledge and Skills:** Based on the NGSS, the scope and sequence of learning in the science program is streamlined. With the District adopting these standards across all grade levels, students will have the prior knowledge and skill necessary to learn all the material presented in this unit.

**Anticipated instructional days for unit:** about 40 days. The schedule and lessons can be adapted and modified to best accommodate the needs of the students. Removal of reading days for reading can be completed in the reading class during time of unit.

**Differentiation techniques or strategies :** Hands-on science proves to be a powerful medium for bringing all students together. The Subject matter is universally interesting, and the joy and satisfaction of discovery are shared by everyone. Active science by itself provides part of the solution to full inclusion and provides many opportunities at one time for differentiated instruction.

There are three principles for Universal Design for Learning (UDL):

- Principle 1: Provide multiple means of representation
- Principle 2: Provide multiple means of action and expression. Offer students alternatives for demonstrating what they know.
- Principle 3: Provide multiple means of engagement. Help learners get interested, be challenged, and stay motivated.

Procedures found effective with students with special needs and students who are learning English are incorporated into the materials and strategies used with students. Science instruction allows students to express their understanding through a variety of modalities. Each student has multiple opportunities to demonstrate his or her strengths and needs including:

- More time with the active investigations or online activities;
- More experience building explanations for the science concepts orally or in writing or drawing;
- Making vocabulary more explicit through new concrete experiences or through reading to students;
- Scaffolding their thinking through graphic organizers;
- Designing individual projects or small-group investigations;
- More opportunities to experience science outside the classroom in a more natural, outdoor environment.
- Based on knowing what students are thinking throughout the module, there are extension activities for experience that might be appropriate for students who need additional practice with the basic concepts as well as those ready for more advanced projects. Interdisciplinary extensions are listed at the end of each investigation. These can be used to meet the individual needs and interests of students.
- Online activities including tutorials and virtual inventions are effective tools to provide differentiated instruction.
- English learners: the science program uses modeling, visuals, and active investigations in small groups at centers. Science vocabulary is introduced in authentic context while students engage in active learning. Strategies for helping all students read, write, speak, and listen are described in the Science-Centered Language Development chapter.

## Grade 4
## Structure, Function and Information Processing

**NGSS Performance Expectations**
**Students who demonstrate understanding can:**

| | |
|---|---|
| LS1-1 | Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction. |
| LS1-2 | Use a model to describe that animals receive different types of information through their senses, process the information in their brain and respond to the information in different ways. |
| 4-ESS3-1 | Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. |

| LS1.A: Structure and Function | Student Learning Objectives | Suggested Assessments |
|---|---|---|
| • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior and reproduction.<br>**LS1.D: Information Processing**<br>• Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.<br>**ESS3.A: Natural Resources**<br>• Energy and fuels that humans use are derived from natural resources, and their use affects the environment in multiple ways. Some | • Students explore how our bones and muscles are interconnected, how our eyes interact with light and impact our vision, and how our brain responds to stimuli in our environment.<br>• Students generate observations and questions about the phenomenon and create an initial model to explain how the owl's body systems work together to catch prey.<br>• Students discover the mechanism by which their muscles control their bones to move their bodies.<br>• Students construct a model of a human finger and observe how pulling on a string (a model for tendons) causes it to bend at the joints. (4-LS1-1)<br>• Students discover the basics of how their eyes work, and figure out some of the causes of vision problems.<br>• Students develop a working model of a human eye. They use a magnifying lens as a model of the cornea | **Mystery Science: Unit "Human Machine"**<br>**Ongoing Assessments**<br>○ Science notebook<br>○ Lab/Response sheets<br>○ Participation/Performance assessment<br>• **Formative Assessments**<br>○ Lesson 1-Muscles and Skeleton<br>○ Lesson 2-Light, Eyes & Vision<br>○ Lesson 3-Structure & Function of eyes<br>○ Lesson 4-Brain, Nerves, & Information Processing<br>• **Summative Assessments**<br>○ Human Machine<br>○ Performance Task |

| | | |
|---|---|---|
| resources are renewable over time, and others are not. | to explore how the structure of this lens is related to the function of our eyes. (4-PS4-2, 4-LS1-1, 4-LS1-2)<br>● Students delve further into the workings of the eye, exploring the function of their iris and pupil.<br>● Students add a smaller pupil to the eye model that they created in the previous lesson. Then they observe how the changing size of the pupil controls how much light enters the eye. (4-PS4-2, 4-LS1-1, 4-LS1-2)<br>● Students explore the brain's role in receiving information from the senses, processing that information, and controlling the muscles to enable movement.<br>● Students test their reflexes with two very quick experiments and one more involved activity. They learn about how we process information in our brains and then respond to that information in different ways. (4-LS1-1, 4-LS1-2)<br>● Students investigate how energy is stored, how it can make objects move, and how collisions transfer energy between objects. Students also construct devices that convert energy from one form into another, such as heat into motion and electricity into light.<br>● Students analyze the advantages and disadvantages of different sources of energy, including burnable fuels and alternative (renewable) energies.<br>● Students obtain and combine information about wind energy, solar energy, and water energy. They use this information to determine the best alternative energy sources for a town called Boulderville. (4-ESS3-1) | **Mystery Science: Unit "Energizing Everything"**<br><br>**Ongoing Assessments**<br>○ Science notebook<br>○ Lab/Response sheets<br>○ Participation/Performance assessment<br>● **Formative Assessments**<br>○ Lesson 8-Renewable Energy and Natural Resources<br>● **Summative Assessments**<br>○ Energizing Everything test<br>○ Performance task |

| Science and Engineering Practices | Crosscutting Concepts |
|---|---|
| ● Developing and Using Models<br>● Engaging in Argument from Evidence<br>● Asking questions<br>● Planning and carrying out investigations | ● Cause and Effect<br>● Systems and System Models<br>● Structure and function<br>● Energy and matter |

| | |
|---|---|
| • Analyzing and interpreting data<br>• Constructing explanations<br>• Obtaining, evaluating, and communicating information | • Stability and change<br>• Scale, proportion and quality<br>***Connections to Engineering, Technology, and Applications of Science***<br><br>**Interdependence of Science, Engineering, and Technology**<br>• Knowledge of relevant scientific concepts and research findings is important in engineering.<br>**Influence of Engineering, Technology, and Science on Society and the Natural World**<br>• Over time, people's needs and wants change, as do their demands for new and improved technologies. (Financial Literacy) |

**Interdisciplinary Connections**

**ELA:** Throughout research and integration of science practices students read leveled texts to gain additional information.

- Students participate in discussion and partnerships to gain further information on various scientific topics.
- W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4- LS1-1) SL.4.5
- Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2)
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS1-1)
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information and provide a list of sources. (4-ESS1-1)
- W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4- ESS1-1)
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS3-1)
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS3-1)
- W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4- ESS3-1)

**Mathematics:** Through Science labs students are required to incorporate the following math standards in order to accurately complete the various tasks related to science:

- 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts.
- Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)
- MP.2 Reason abstractly and quantitatively. (4-ESS1-1)
- MP.4 Model with mathematics. (4-ESS1-1)
- 4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. (4-ESS1-1)

**21st Century Life and Careers - Technology (link to standard 8.1 and 8.2) / Career and 21st Century Skills (link to standard 9.1, 9.2, 9.2)**
**(Include standard number and activity examples from each area):**

**Computer Science and Design Thinking**

- **8.1 Computer Science**
  - 8.1 Data and Analysis
    - 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.
  - Effects of Technology on the Natural World
    - 8.2.5.ETW.4: Explain the impact that resources, such as energy and materials used to develop technology, have on the environment.

**Computer Science and Design Thinking**

- 8.2 Design Thinking
  - Engineering Design
    - 8.2.5.ED.1 - Explain the functions of a system and its subsystems.
    - 8.2.5.ED.2 - Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
    - 8.2.5.ED.3 - Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
    - 8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
    - 8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process.
    - 8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and tradeoffs identified in the design process.

**Career and 21st Century Skills**

- 9.2 Career Awareness, Preparation, and Training
  - Career Awareness and Planning
    - 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.

        - 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
- 9.4 Life Literacies and Key Skills
    - Creativity and Innovation
        - 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.
    - Critical Thinking and Problem-Solving
        - 9.4.5.CT.1 - Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).
        - 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.4 - Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global.
    - Global and Cultural Awareness
        - 9.4.5.IML.7 - Evaluate the degree to which information meets a need including social emotional learning, academic, and social.
    - Information and Media Literacy
        - 9.4.5.IML.2 - Create a visual representation to organize information about a problem or issue.
        - 9.4.5.IML.6 - Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions.

**NJ Student Required Curriculum Statues**

- **Climate Change**
    - 4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

- **CRP1. Act as a responsible and contributing citizen and employee. Example:** Students will develop understanding and value of the importance of making contributions to classroom discussions to support the learning community.
- **CRP4. Communicate clearly and effectively and with reason.** Example: Students will learn and apply classroom protocols that support clear and effective communication to express, refine, and critique mathematical reasoning.
- **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them:** Students will understand the expectation that true mathematical problems require a strong perseverance to develop partial or complete solutions. Classroom communication strategies and routines will support student transfer of critical thinking skills.

**2- Digital Citizenship:** Students recognize the rights, responsibilities, and opportunity of learning, living and working in an interconnected digital world and they act and model in ways that are safe, legal and ethical. Students use Chromebooks to explore online resources and complete differentiated assignments. Elementary grades lay the foundation for future academic and career success.

- Example: goal setting lessons, growth mindset

Warren QSAC Accommodations Chart

**Available Resources**

**www.brainpop.com**
**www.nsta.org**

**Unit Summary**
**Mystery Science: Unit "Energizing Everything"**
In this unit, students explore energy! Students investigate how energy is stored, how it can make objects move, and how collisions transfer energy between objects. Students also construct devices that convert energy from one form into another, such as heat into motion and electricity into light.

**Mystery Science: Unit "Human Machine"**
In this unit, students investigate structures and functions of the human body. Students explore how our bones and muscles are interconnected, how our eyes interact with light and impact our vision, and how our brain responds to stimuli in our environment.

**Prior Knowledge and Skills:** Based on the NGSS, the scope and sequence of learning in the science program is streamlined. With the District adopting these standards across all grade levels, students will have the prior knowledge and skill necessary to learn all the material presented in this unit.

**Anticipated instructional days for unit:** about 33 days. The schedule and lessons can be adapted and modified to best accommodate the needs of the students. Removal of reading days for reading can be completed in the reading class during time of unit.

**Differentiation techniques or strategies :** Hands-on science proves to be a powerful medium for bringing all students together. The subject matter is universally interesting, and the joy and satisfaction of discovery are shared by everyone. Active science by itself provides part of the solution to full inclusion and provides many opportunities at one time for differentiated instruction.

There are three principles for Universal Design for Learning (UDL):

- Principle 1: Provide multiple means of representation.
- Principle 2: Provide multiple means of action and expression. Offer students alternatives for demonstrating what they know.
- Principle 3: Provide multiple means of engagement. Help learners get interested, be challenged, and stay motivated.

Procedures found effective with students with special needs and students who are learning English are incorporated into the materials and strategies used with students. Science instruction allows students to express their understanding through a variety of modalities. Each student has multiple opportunities to demonstrate his or her strengths and needs including:

- More time with the active investigations or online activities;
- More experience building explanations for the science concepts orally or in writing or drawing;
- Making vocabulary more explicit through new concrete experiences or through reading to students.
- Scaffolding their thinking through graphic organizers;
- Designing individual projects or small-group investigations;
- More opportunities to experience science outside the classroom in a more natural, outdoor environment.

- Based on knowing what students are thinking throughout the module, there are extension activities for experience that might be appropriate for students who need additional practice with the basic concepts as well as those ready for more advanced projects. Interdisciplinary extensions are listed at the end of each investigation. These can be used to meet the individual needs and interests of students.
- Online activities including tutorials and virtual inventions are effective tools to provide differentiated instruction.
- English learners: the science program uses modeling, visuals, and active investigations in small groups at centers. Science vocabulary is introduced in authentic context while students engage in active learning. Strategies for helping all students read, write, speak, and listen are described in the Science-Centered Language Development chapter.

## Grade 4
## Earth's Systems: Processes that Shape the Earth

**NGSS Performance Expectations**

**Students who demonstrate understanding can:**

| | |
|---|---|
| 4-ESS1-1 | Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. |
| 4-ESS2-1 | Make observations and/or measurements to provide evidence of the effects of weathering on the rate of erosion by water, ice, wind or vegetation. |
| 4-ESS2-2 | Analyze and interpret data from maps to describe patterns of Earth's features. |
| 4-ESS3-2 | Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans and climate change on humans. |

| **ESS1.C: The History of Planet Earth** | **Student Learning Objectives** | **Suggested Assessments** |
|---|---|---|
| • Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. | • In this unit, students investigate features and processes of the Earth's surface. Students explore the rapid process of volcanic eruptions! In contrast, students also explore the gradual Earth processes of weathering and erosion. Students apply their knowledge and design solutions to | **Mystery Science: Unit "Birth of Rocks"**<br>**Ongoing Assessments**<br>○ Science notebook<br>○ Lab/Response sheets<br>○ Participation/Performance assessment<br>• **Formative Assessments** |
| **ESS2.A: Earth Materials and Systems** | | |

| | | |
|---|---|---|
| • Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.<br><br>**ESS2.B: Plate tectonics and large scale system interactions**<br><br>• The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth.<br><br>**ESS2.E: Biology**<br><br>• Living things affect the physical characteristics of their regions.<br><br>**ESS3.B: Natural Hazards**<br><br>• A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.<br><br>**ETS1.B: Designing solutions to engineering problems**<br><br>• Testing a solution involves investigating how well it performs under a range of likely conditions.*(secondary to 4-ESS3-2)* | mitigate the impacts of these processes on humans.<br>• Students generate observations and questions about the phenomenon and create an initial explanation to explain what killed the prehistoric animals, how their bones ended up underground, and what changes happened to the land that uncovered their fossils. *(4-ESS2-2 4-ESS1-1 4-ESS3-2 4-ESS2-1*)<br>• Students explore the past and present pattern of where volcanoes exist on the earth.<br>• Students plot volcano locations on a world map and look for patterns. Students analyze these maps to discover that volcanoes form a “Ring of Fire” around the Pacific Ocean. (4-ESS1-1, 4-ESS2-2)<br>• Students will investigate how differences in lava types explain differences in the shape and eruption patterns among volcanoes.<br>• Students compare two different types of "lava" -- thin and thick. They use this information to figure out why volcanoes have different shapes and how the type of lava explains why some volcanoes explode. (4-ESS1-1)<br>• Students will explore how solid rock breaks apart into smaller pieces through a process called weathering (including root-wedging and ice-wedging).<br>• Students use sugar cubes as a model for rocks. They perform an experiment with this model to understand the process of weathering and how this process explains why rocks at the tops of mountains are jagged, while those at the bottom are rounded. (4-ESS1-1, 4-ESS2-1<br>• Students will learn about the types, causes, and dangers of landslides.<br>• Students are faced with the engineering problems of protecting a house from a | ○ Lesson 1-Volcanoes & Patterns of Earth’s surface<br>○ Lesson 2-Volcanoes & Rock Cycle<br>○ Lesson 3-Weathering and Erosion<br>○ Lesson 4-Erosion, Natural Hazards, & Engineering<br>• **Summative Assessments**<br>○ Birth of Rocks<br>○ Performance Task |

| | | |
|---|---|---|
| | landslide and preventing a landslide from happening. They use a brainstorming technique to design creative solutions. (4-ESS2-1, 4-ESS3-2). | |

| Science and Engineering Practices | Crosscutting Concepts |
|---|---|
| • Asking questions<br>• Developing and using models<br>• Planning and carrying out investigations<br>• Analyzing and interpreting data<br>• Constructing explanations and designing solutions<br>• Using mathematics and computational thinking<br>• Engaging in argument from evidence<br>• Obtaining, evaluating and communicating information | • Patterns<br>• Cause and effect<br>• Scale, proportion, and quantity<br>• Systems and system models<br>• Structure and function<br>• Stability and change<br>***Connections to Nature of Science***<br>**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**<br>• Science assumes consistent patterns in natural systems.<br>***Connections to Engineering, Technology, and Applications of Science***<br>**Influence of Engineering, Technology, and Science on Society and the Natural World**<br>• Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. |

**Interdisciplinary Connections**

**ELA:** Throughout research and integration of science practices students read leveled texts to gain additional information.
- Students participate in discussion and partnerships to gain further information on various scientific topics.
- RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (4-ESS2-2)
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS2-1)
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS2-1)
- RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-ESS3-2)
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-ESS3-2)

**Mathematics:** Through Science labs students are required to incorporate the following math standards in order to accurately complete the various tasks related to science:
- MP.2 Reason abstractly and quantitatively. (4-ESS2-1)
- MP.4 Model with mathematics. (4-ESS2-1)
- MP.5 Use appropriate tools strategically. (4-ESS2-1)

- 4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. (4-ESS2-1)
- 4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. (4-ESS2-1), (4-ESS2-2)

**21st Century Life and Careers - Technology (link to standard 8.1 and 8.2) / Career and 21st Century Skills (link to standard 9.1, 9.2, 9.2)**
**(Include standard number and activity examples from each area):**

**Computer Science and Design Thinking**

- **8.1 Computer Science**
  - 8.1 Data and Analysis
    - 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.
  - Effects of Technology on the Natural World
    - 8.2.5.ETW.4: Explain the impact that resources, such as energy and materials used to develop technology, have on the environment.

**Career and 21st Century Skills**

- 9.2 Career Awareness, Preparation, and Training
  - Career Awareness and Planning
    - 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.

        - 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
- 9.4 Life Literacies and Key Skills
    - Creativity and Innovation
        - 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.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 (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).
        - 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. (e.g., 6.3.5.CivicsPD.3, W.5.7)
    - Critical Thinking and Problem-Solving
        - 9.4.5.CT.1 - Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).
        - 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.4 - Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global.
    - Global and Cultural Awareness
        - 9.4.5.IML.7 - Evaluate the degree to which information meets a need including social emotional learning, academic, and social.
    - Information and Media Literacy
        - 9.4.5.IML.2 - Create a visual representation to organize information about a problem or issue.
    - 9.4.5.IML.6 - Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions.

**NJ Student Required Curriculum Statues**

- **Climate Change**
    - 4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering on the rate of erosion by water, ice, wind or vegetation.
    - 4-ESS2-2 Analyze and interpret data from maps to describe patterns of Earth's features.
    - 4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans and climate change on humans.

**CRP1. Act as a responsible and contributing citizen and employee. Example:** Students will develop understanding and value of the importance of making contributions to classroom discussions to support the learning community.

- **CRP4. Communicate clearly and effectively and with reason.** Example: Students will learn and apply classroom protocols that support clear and effective communication to express, refine, and critique mathematical reasoning.
- **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them:** Students will understand the expectation that true mathematical problems require a strong perseverance to develop partial or complete solutions. Classroom communication strategies and routines will support student transfer of critical thinking skills.

- **2- Digital Citizenship:** Students recognize the rights, responsibilities, and opportunity of learning, living and working in an interconnected digital world and they act and model in ways that are safe, legal and ethical. Students use Chromebooks to explore online resources and complete differentiated assignments.

CRP4. Communicate clearly and effectively and with reason.

- Example: To retell or summarize

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

- Example: reasoning and finding evidence through reading.

9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

- Example: goal setting lessons, growth mindset

**Warren QSAC Accommodations Chart**

**Available Resources**
www.brainpop.com
www.nsta.org

**Unit Summary**
**Mystery Science: Unit "Birth of Rocks"**
In this unit, students investigate features and processes of the Earth's surface. Students explore the rapid process of volcanic eruptions! In contrast, students also explore the gradual Earth processes of weathering and erosion. Students apply their knowledge and design solutions to mitigate the impacts of these processes on humans.

**Prior Knowledge and Skills:** Based on the NGSS, the scope and sequence of learning in the science program is streamlined. With the District adopting these standards across all grade levels, students will have the prior knowledge and skill necessary to learn all the material presented in this unit.

**Anticipated instructional days for unit:** about 35 days. The schedule and lessons can be adapted and modified to best accommodate the needs of the students. Removal of reading days for reading can be completed in the reading class during time of unit.

**Differentiation techniques or strategies:** Hands-on science proves to be a powerful medium for bringing all students together. The subject matter is universally interesting, and the joy and satisfaction of discovery are shared by everyone. Active science by itself provides part of the solution to full inclusion and provides many opportunities at one time for differentiated instruction.

There are three principles for Universal Design for Learning (UDL):

- Principle 1: Provide multiple means of representation.
- Principle 2: Provide multiple means of action and expression. Offer students alternatives for demonstrating what they know.
- Principle 3: Provide multiple means of engagement. Help learners get interested, be challenged, and stay motivated.

Procedures found effective with students with special needs and students who are learning English are incorporated into the materials and strategies used with students. Science instruction allows students to express their understanding through a variety of modalities. Each student has multiple opportunities to demonstrate his or her strengths and needs including:

- More time with the active investigations or online activities;
- More experience building explanations for the science concepts orally or in writing or drawing;
- Making vocabulary more explicit through new concrete experiences or through reading to students;
- Scaffolding their thinking through graphic organizers;
- Designing individual projects or small-group investigations;
- More opportunities to experience science outside the classroom in a more natural, outdoor environment.
- Based on knowing what students are thinking throughout the module, there are extension activities for experience that might be appropriate for students who need additional practice with the basic concepts as well as those ready for more advanced projects. Interdisciplinary extensions are listed at the end of each investigation. These can be used to meet the individual needs and interests of students.
- Online activities including tutorials and virtual inventions are effective tools to provide differentiated instruction.
- English learners: the science program uses modeling, visuals, and active investigations in small groups at centers. Science vocabulary is introduced in authentic context while students engage in active learning. Strategies for helping all students read, write, speak, and listen are described in the Science-Centered Language Development chapter.

**Grade 3-5 Engineering Design**
*(Embedded within the Energy*
*& Soil, Rocks, and Landforms Unit)*

**NGSS Performance Expectations**

**Students who demonstrate understanding can:**

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.

| **ETS1-A: Defining and Delimiting Engineering Problems** | **Student Learning Objectives** | **Suggested Assessments** |
|---|---|---|
| • 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.<br><br>**ETS1-B: Developing Possible Solutions**<br><br>• Research on a problem 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. | In this unit, students explore energy! Students investigate how energy is stored, how it can make objects move, and how collisions transfer energy between objects. Students also construct devices that convert energy from one form into another, such as heat into motion and electricity into light.<br><br>• Students construct an explanation of how energy is stored, released, and transferred in chain reactions, such as falling dominoes.<br>• Students are presented with an engineering design challenge to create their own chain reaction machine--a project they will continue in the next experiment.<br>• Students experiment with a "Chain-Reaction Starter Kit." This kit includes a lever and a ramp, which serve as the first two steps of a chain-reaction machine. (4-PS3-4, 3-5-ETS1-1)<br>• Students learn about storing, releasing, and transferring energy.<br>• Students complete the chain-reaction machine they started building in the previous lesson. *(*4-PS3-4, 3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3) | **Mystery Science: Unit "Energizing Everything"**<br>**Ongoing Assessments**<br>○ Science notebook<br>○ Lab/Response sheets<br>○ Participation/Performance assessment<br>• **Formative Assessments**<br>○ Lesson 4 - Energy and Transfer and Engineering<br>○ Lesson 5 - Energy and Transfer and Engineering<br>• **Summative Assessments**<br>○ Energizing Everything test<br>○ Performance Task |

| | | |
|---|---|---|
| • 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.<br>• Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. | | |
| **ETS 1-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. | | |

| Science and Engineering Practices | Crosscutting Concepts |
|---|---|
| • Asking Questions and Defining problems<br>• Developing and using models<br>• Planning and carrying out investigations<br>• Analyzing and interpreting data<br>• Using Mathematical and computational thinking<br>• Constructing explanations and designing solutions<br>• Engaging in argument from evidence<br>• Obtaining, evaluating, and communicating information | • Patterns<br>• Cause and Effect<br>• Scale, proportion, and quantity<br>• Systems and system models<br>• Energy and matter<br><br>***Connections to Engineering, Technology, and Applications of Science***<br><br>**Influence of Science, Engineering, Technology, and Science on Society and the Natural World**<br>• People's needs and wants change over time, as do their demands for new and improved technologies. (Financial Literacy)<br>• Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks and meet societal demands. |

## Interdisciplinary Connections

**ELA:** Throughout research and integration of science practices students read leveled texts to gain additional information.
Students participate in discussion and partnerships to gain further information on various scientific topics.

- RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3-5-ETS1-2)
- RI.5.1 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (3-5-ETS1-2)
- RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS1-2)
- W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1), (3-5-ETS1-3)
- W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work and provide a list of sources. (3-5-ETS1-1), (3-5-ETS1-3)

**Mathematics:** Through Science labs students are required to incorporate the following math standards in order to accurately complete the various tasks related to science:

- MP.2 Reason abstractly and quantitatively. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)
- MP.4 Model with mathematics. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)
- MP.5 Use appropriate tools strategically. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)
- 3-5.OA Operations and Algebraic Thinking (3-5-ETS1-1), (3-5-ETS1-2)

**21st Century Life and Careers - Technology (link to standard 8.1 and 8.2) / Career and 21st Century Skills (link to standard 9.1, 9.2, 9.2)**
**(Include standard number and activity examples from each area):**

**Technology**

- 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.
- 8.2.5.ETW.4: Explain the impact that resources, such as energy and materials used to develop technology, have on the environment.

**Career and 21st Century Skills**

- 9.2 Career Awareness, Preparation, and Training
  - Career Awareness and Planning
    - 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
    - 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
- 9.4 Life Literacies and Key Skills
  - Creativity and Innovation
    - 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.
  - Critical Thinking and Problem-Solving
    - 9.4.5.CT.1 - Identify and gather relevant data that will aid in the problem-solving process.
    - 9.4.5.CT.4 - Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global.
  - Global and Cultural Awareness
    - 9.4.5.IML.7 - Evaluate the degree to which information meets a need including social emotional learning, academic, and social.
  - Information and Media Literacy
    - 9.4.5.IML.2 - Create a visual representation to organize information about a problem or issue.
    - 9.4.5.IML.6 - Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions.

**NJ Student Required Curriculum Statues**

- **Climate Change**
  - 3-5ETS1-1 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.

- **CRP1. Act as a responsible and contributing citizen and employee. Example:** Students will develop understanding and value of the importance of making contributions to classroom discussions to support the learning community.
- **CRP4. Communicate clearly and effectively and with reason.** Example: Students will learn and apply classroom protocols that support clear and effective communication to express, refine, and critique mathematical reasoning.
- **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them:** Students will understand the expectation that true mathematical problems require a strong perseverance to develop partial or complete solutions. Classroom communication strategies and routines will support student transfer of critical thinking skills.
- **2- Digital Citizenship:** Students recognize the rights, responsibilities, and opportunity of learning, living and working in an interconnected digital world and they act and model in ways that are safe, legal and ethical. Students use Chromebooks to explore online resources and complete differentiated assignments.

**Warren QSAC Accommodations Chart**