Science Mission Statement:

The Glen Ridge Public School’s science curriculum seeks to inspire scientifically-literate citizens who will be able to participate in a dynamic global community. Our program fosters a spirit of intellectual curiosity and collaborative problem solving that is innovative, experiential, thought-provoking, and developmentally appropriate. Our students will use scientific methodology to evaluate and critique global issues relating to Life Sciences, Physical Sciences, The Sciences of Earth & Space, and Engineering Sciences. Students will be challenged and will be encouraged to take risks and develop critical scientific thinking skills.

Course Description:
Over the course of the year, Ridgewood Avenue School fourth graders study a variety of sciences including, but not limited to life, physical, and earth sciences. Students begin the year by understanding appropriate scientific practices such as generating and evaluating the accuracy of one’s hypothesis. Following this, classes move towards physical science. During this time, students learn about speed, energy, stored energy, collisions, engineering, electrical energy, heat, engines, energy transfer, energy resources, and environmental impacts. The third unit, life science, looks at topics related to muscles & skeleton, eyes & vision, and brain & nerves. Earth science is the fourth unit of the year. This primarily looks at volcanoes, lava & rock cycle, Earth's surface, weathering, destructive forces, erosion, and natural hazards & preventive engineering. The final unit of fourth grade looks closely at sound, waves, and communication. Studies rely on various forms of research as well as hands on activities and is directly connected to the Mystery Science program.

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<tr>
<th>Name of Course</th>
<th>Unit 1: Scientific Practices</th>
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<td>Time Allotted (days of instruction):</td>
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New Jersey Student Learning Standards (NJSLS)
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.

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<th>Essential Questions</th>
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<td>1. What are the steps of the Scientific Method?</td>
<td>● SWBAT develop and use models by asking questions and observing</td>
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<td>2. How is the Scientific Method is used for problem solving?</td>
<td>● SWBAT plan and carry out investigations</td>
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<td>3. How can the STEM Design Cycle be used to generate questions about each experiment?</td>
<td>● SWBAT analyze and interpret data</td>
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<td>● SWBAT use mathematics and computational thinking</td>
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<td>● SWBAT construct explanations and</td>
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|                      | ● Students must work together to create a plan to rescue Fred the gummy worm by flipping his boat (cup) and putting on his gummy life preserver all without touching Fred or dropping him into the "water."
|                      | ● Students will learn about independent, dependent and control variables by creating paper rockets. |
design solutions

- SWBAT obtain, evaluate and communicate information

Students will conduct background research about real rockets before constructing a hypothesis about what will happen to the dependent variable if they change the independent variable.

Additional Related Activities/Resources:
- Scientific Process Newsela and Readworks Articles (Leveled)
- Enrichment STEM Activities*
- Scientific Method Chart
- Scientific Process Song - Video
- BrainPop - Scientific Method

Resources/Materials

- Save Fred Activity
- Rockets for Scientific Method

Interdisciplinary Connections

ELA - Key Ideas & Details: NJSLSA.R1 | Integration of Knowledge and Ideas: NJSLSA.R7, NJSLSA.R10 | Writing: NJSLSA.W1, NJSLSA.W2, NJSLSA.W4, NJSLSA.W6, NJSLSA.W7, NJSLSA.W8, NJSLSA.W9 | Speaking & Listening: NJSLSA.SL1, NJSLSA.SL2, NJSLSA.SL5
Career Awareness, Exploration, and Preparation - 9.3 - All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age

21st Century Life and Careers

9.1 - All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

Technology Standards

8.1 - All students will use computer applications to gather and organize information and to solve problems.
8.2 - All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world as they relate to the individual, society, and the environment.
6.3 - Active Citizenship in the 21st Century All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.

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<td>• Cooperative and partner activities.</td>
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<td>• Setting Individual Goals</td>
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<td>• Give students a job in a group. Monitor that they are participating</td>
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## Unit 2: Physical Science

**Time Allotted (days of instruction):** 45 Days

**New Jersey Student Learning Standards (NJSLS)**

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<td>4-PS3-1</td>
<td>Use evidence to construct an explanation relating the speed of an object to the energy of that object.</td>
<td>1. Students build a model of an amusement park ride called the Twist-o-matic. They use the model to carry out an investigation to examine the relationship between energy and speed. Students analyze and interpret data from their models, comparing the speed of the ride using a thin versus thick rubber band.</td>
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<td>4-PS3-2</td>
<td>Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.</td>
<td>2. Students build a model of a roller coaster and carry out an investigation using marbles. Students analyze and interpret data from the model to explain the connection between height, energy and motion.</td>
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<tr>
<td>4-PS3-3</td>
<td>Ask questions and predict outcomes about the changes in energy that occur when objects collide.</td>
<td>3. Students conduct an investigation using a model roller coaster to determine how energy can be stored in the hills of the coaster and how that energy is released to make the marbles go different distances. Students analyze and interpret data from the model to explain how the heights of different hills give marbles the energy to roll.</td>
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<tr>
<td>4-PS3-4</td>
<td>Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.</td>
<td>4. Students begin to design a chain reaction machine. They start by figuring out how to connect two components of the chain reaction: the lever and the slide.</td>
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<tr>
<td>4-ESS3-1</td>
<td>Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.</td>
<td>5. Students design a chain reaction machine that</td>
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### Essential Questions

1. How is your body similar to a car?
2. What makes roller coasters go so fast?
3. Why is the first hill of a roller coaster always the highest?
4. Could you knock down a building using only dominoes?
5. Can you build a chain reaction machine?
6. What if there were no electricity?
7. How long did it take to travel across the country before cars and planes?
8. Where does energy come from?

### Student Learning Objectives

1. SWBAT - Use evidence to construct an explanation relating the speed of an object to the energy of the object. (4-PS3-1); 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-ETS1-1)
2. SWBAT - Use evidence to construct an explanation relating the speed of an object to the energy of the object. (4-PS3-1); Ask questions and predict outcomes about the changes in energy that occur when objects collide. (4-PS3-3)
3. SWBAT - Ask questions and predict outcomes about the changes in energy that occur when objects collide. (4-PS3-3)
4. SWBAT - Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. (4-PS3-4)
includes specified criteria for success and constraints on materials, time, or cost. (3-5-ETS-1-1)

5. SWBAT - [cont. From #4] 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-ETS1-2); 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. (3-5-ETS1-3)

6. SWBAT - Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. (4-PS3-2); Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. (4-PS3-4)

7. SWBAT - Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. (4-PS3-2); Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. (4-PS3-4)

8. SWBAT - Use evidence to construct an explanation relating the speed of an object to the energy of the object. (4-PS3-1)

Additional Related Activities/Resources:
- Energy Scavenger Hunt - [MS]
- Energy Newsela and Readworks Articles (Leveled)
- Roller Coaster & Energy Videos
- Colliding Marbles activity*
- Swinging Science Activity - Pendulum Study*
- Herringbone Chains Activity*
- Electrical Energy Videos
- BrainPop - Energy, Measuring Matter, Galileo, Albert Einstein, Sally Ride

Resources/Materials

Interdisciplinary Connections
- Mystery Science - Energizing Everything - Mysteries 1-8
- ELA - Key Ideas & Details: NJSLSA.R1 | Integration of Knowledge and Ideas: NJSLSA.R7, NJSLSA.R10 | Writing: NJSLSA.W1, NJSLSA.W2, NJSLSA.W4, NJSLSA.W6, NJSLSA.W7, NJSLSA.W8, NJSLSA.W9 | Speaking & Listening: NJSLSA.SL1, NJSLSA.SL2, NJSLSA.SL5
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- Cooperative and partner activities.
- Give students a job in a group. Monitor that they are participating
- Direct instruction of new vocabulary. Teachers should also provide practice in pronouncing new words. Provide books in the native language when available.
- Determine key concepts for the unit and define language and content objects for each lesson.

### Organizational Strategies:
- modifying oral presentations
- modify written assignments
- allowing additional time
- asking students to repeat directions to ensure understanding
- extended test taking time (50%)
- repeating directions (e.g. giving written directions as well as verbal)
- giving cooperative learning or group assignments
- long term project modifications
- homework modifications
- chunk long term projects and assignments

### Name of Course

**Unit 3: Life Science**

**Time Allotted (days of instruction): 20 Days**

**New Jersey Student Learning Standards (NJSLS)**

4-LS1-1 - Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

4-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-PS4-2 - Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

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<td>1. Why do your biceps bulge? 2. What do people who are blind see? 3. How can some animals see in the dark? 4. How does your brain control your body?</td>
<td>1. SWBAT - Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. (4-LS1-1) 2. SWBAT - Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. (4-PS4-2); Use a model to describe that animals receive different types of</td>
<td>1. Students build a model of a finger that they then use to construct an explanation for how fingers move. 2. Students build a model of an eyeball that they then use to construct an explanation of why some people have blurry vision. 3. Students conduct an investigation to see how pupils change in response to light. Students build a model of an eye to explain how changes in pupil size changes the image that appears on the retina. 4. Students conduct investigations to explore how the</td>
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information through their senses, process the information in their brain, and respond to the information in different ways. (4-LS1-2)

3. SWBAT - Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. (4-PS4-2); 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-LS1-2)

4. SWBAT - Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. (4-LS1-1); 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-LS1-2)

Additional Related Activities/Resources:
- Muscle & Vision Newsela and Readworks Articles (Leveled)
- Robot Hand Activity & Experiment*
- NSTA - Thumbs vs. Fingers Activity*
- Bones & Muscles - Power of Togetherness*
- Vision Test
- Lens Image Flip Discussion
- Eyes Videos
- Think Fast Dollar Bill Activity*
- Reaction Time #1 #2
- BrainPop - Eyes & Muscles

Resources/Materials
- Mystery Science - Life Science - Mysteries 1-4

Interdisciplinary Connections
ELA - Key Ideas & Details: NJSLSA.R1 | Integration of Knowledge and Ideas: NJSLSA.R7, NJSLSA.R10 | Writing: NJSLSA.W1, NJSLSA.W2, NJSLSA.W4, NJSLSA.W6, NJSLSA.W7, NJSLSA.W8, NJSLSA.W9 | Speaking & Listening: NJSLSA.SL1, NJSLSA.SL2, NJSLSA.SL5

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| **Modifications** | | | |
|-------------------|-------------------|------------------|
| **English Language Learners** | **Special Education/504** | **Gifted and Talented** |
- Provide correction for language errors by modeling, not overt correction
- Ability to access Google translate in native language
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Environmental Strategies:
- providing preferential seating

Motivational Strategies:
- immediate reinforcement or consequences

Instructional Strategies:
- giving assignments orally and visually
- reducing quantity of material required
- modifying oral presentations
- modify written assignments

Organizational Strategies:
- allowing additional time
- asking students to repeat directions to ensure understanding
- extended test taking time (50%)
- repeating directions (e.g. giving written directions as well as verbal)
- giving cooperative learning or group assignments
- long term project modifications
- homework modifications
- chunk long term projects and assignments

<table>
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<tr>
<th>Name of Course</th>
<th>Unit 4: Earth Science</th>
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**Time Allotted (days of instruction): 20 Days**

**New Jersey Student Learning Standards (NJSL)**

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 or 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.

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.

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<th>Essential Questions</th>
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<th>Activities</th>
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- Enrichment activities listed above (*)
- Compacting the Curriculum
- Student Lead Activities
- Independent Projects
- Leveled Centers
- Higher Level Thinking & Discussions
- Team Teaching & Collaboration
- Academic Contests
- Setting Individual Goals
| 1. Could a volcano pop up where we live? | 1. **SWBAT** - Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. (4-ESS1-1); Analyze and interpret data from maps to describe patterns of Earth’s features. (4-ESS2-2) |
| 2. Why do volcanoes explode? | 2. **SWBAT** - Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. (4-ESS1-1) |
| 3. Will a mountain last forever? | 3. **SWBAT** - Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. (4-ESS1-1); Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. (4-ESS2-1) |
| 4. How could you survive a landslide? | 4. **SWBAT** - Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. (4-ESS2-1); Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. (4-ESS3-2) |

**Resources/Materials**
- **Mystery Science - The Birth of Rocks - Mysteries 1-4**

**Interdisciplinary Connections**
- **ELA** - Key Ideas & Details: NJSLSA.R1 | Integration of Knowledge and Ideas: NJSLSA.R7, NJSLSA.R10 | Writing: NJSLSA.W1, NJSLSA.W2, NJSLSA.W4, NJSLSA.W6, NJSLSA.W7, NJSLSA.W8, NJSLSA.W9 | Speaking & Listening: NJSLSA.SL1, NJSLSA.SL2, NJSLSA.SL5

**Career Awareness, Exploration, and Preparation - 9.3 - All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation - 9.3 - All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age**

**21st Century Life and Careers**
- 9.1 - All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills
needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

**Technology Standards**

8.1 - All students will use computer applications to gather and organize information and to solve problems.
8.2 - All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world as they relate to the individual, society, and the environment.
6.3 - Active Citizenship in the 21st Century All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.

### Assessments

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● Strategic Questioning  
● Think-Pair-Share Classroom  
● Polls  
● Compare & Contrast  
● K-W-L Charts Smart Responses  
● Center Activities  
● Makerspace Activity  
● Worksheets  
● Thumbs Up/Thumbs Down  
● Whiteboard Responses Kahoot  
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● Lesson/Mystery Test  
● Projects  
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● Study Island | ● Experiment  
● Project  
● Presentations  
● Models  
● Guest Speaker  
● In-House Field Trip |

### Modifications

**English Language Learners**

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- giving assignments orally and visually
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- allowing additional time

**Special Education/504**

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Name of Course

Unit 5: Waves & Information

Time Allotted (days of instruction): 15 Days

New Jersey Student Learning Standards (NJSLS)

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-PS4-3 - Generate and compare multiple solutions that use patterns to transfer information.
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.

Essential Questions

1. How far can a whisper travel?
2. What would happen if you screamed in outer space?
3. Why are some sounds high and some sounds low?

Student Learning Objectives

1. SWBAT - Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. (4-PS4-1); Generate and compare multiple solutions that use patterns to transfer information. (4-PS4-3)
2. SWBAT - Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. (4-PS4-1)
3. SWBAT - Develop a model of waves to describe patterns in terms of amplitude

Activities

1. Students document their understanding of how vibrations travel using a model of their paper cup telephones. Students then design their own series of investigations to figure out how to make their telephone work better in different circumstances. Students construct an explanation of how the telephone works. Students extend the lesson by developing a way to send a message using a pattern of sounds.
2. Students conduct investigations with balloons to experience the vibrations caused by sound of their voices. Students construct an explanation that sound is a vibration. Students then develop a model to
and wavelength and that waves can cause objects to move. (4-PS4-1)

3. Students analyze and interpret data from oscilloscopes to determine how wavelengths differ between high and low pitch sounds. Students make claims and argue from evidence about which wavelength patterns were generated from different pitches. Students then use a rope to model waves created by different pitches and begin to explore the relationship between wavelength and frequency.

**Additional Related Activities/Resources:**
- Secret Bells Experiments*
- Tin Can Telephones & Morse Code
- Sound & Problem Solving Newseala and Readworks Articles (Leveled)
- Oscilloscope Experiments*
- Sound Challenge using ChromeBook microphone
- Hearing Test
- Videos on Sound & Waves
- BrainPop - Sound Waves, Wave Game

**Resources/Materials**
- Mystery Science - Physical Science - Mysteries 1-3

**Interdisciplinary Connections**
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