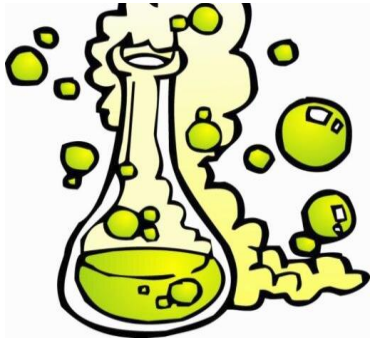
Secaucus Board of Education

Grade 4 Science Curriculum

Course Code: 411

Curriculum and Instruction Department



Born on August, 2015
Aligned to the NJSLS – Science, 21st Century Life and Careers, Technology (2016) and the NJSLS Standards for ELA and Mathematics (2016)
Approved by the Secaucus Board of Education on August 27. 2015

District Equity Statement

The Board of Education directs that all students enrolled in the schools of this district shall be afforded equal educational opportunities in strict accordance with the law. No students shall be denied access to or benefit from any educational program or activity or from a co-curricular or athletic activity on the basis of the student's race, color, creed, religion, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, gender identity or expression, socioeconomic status, or disability….The Board directs the Superintendent to allocate faculty, administrators, support staff members, curriculum materials, and instructional equipment supplies among and between the schools and classes of this district in a manner that ensures equivalency of educational opportunity throughout this district. The school district's curricula in the following areas will eliminate discrimination, promote mutual acceptance and respect among students, and enable students to interact effectively with others, regardless of race, color, creed, religion, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, gender identity or expression, socioeconomic status, or disability:

1. School climate/learning environment
2. Courses of study, including Physical Education
3. Instructional materials and strategies
4. Library materials
5. Software and audio-visual materials
6. Guidance and counseling
7. Extra-curricular programs and activities
8. Testing and other assessments.

Excerpt from Secaucus Board of Education, Policy 5750, Edited September 2016

Fourth Grade Science Course Descriptions

The Fourth grade Science Curriculum is taught using *New Jersey Center for Teaching and Learning Progressive Science Initiative* coursework. All components of these units present a balance of Biological, Physical, Earth/Space and Environmental Science topics. The units covered in this course include: Molecules to Organisms, Energy, Waves, Light & Information, Energy & Natural Resources, and Natural Hazards. All courses are designed to prepare students for The New Jersey Assessment of Skills and Knowledge (NJASK), Middle school science courses, and for scientific problems and issues in their everyday lives.

The material is presented at a moderate pace. Lessons are based on discussions and student-driven activities. Hands-on activities are meant to show connections to real-life science applications and to promote critical thinking and problem solving skills. Students who are placed in this course based on ESL placement will also receive accommodations based upon their ESL level. Students receiving Special Education services will receive modifications and accommodations to information and assessments as indicated in their Individual Education Plan.

Course Modifications (ELLs, Special Education, Gifted and Talented)

The course instructor will determine, with the assistance of guidance counselors, teacher assistant/aides, and/or special education teachers, what modifications will be made for his/her students. Such examples of modifications can include, but not be limited to:

- Extended time as needed
- Modification of tests and quizzes
- Preferential seating
- Alternative/Formative assessment (projects)
- Effective teacher questioning (ranging from simple recall to higher order critical thinking questions)
- Supplemental materials
- Cooperative learning
- Teacher tutoring
- Peer tutoring
- Differentiated Instruction

Interdisciplinary Connections

The following NJSLS Standards for ELA and Mathematics depict what standards align to the science standards taught in this 4th Grade Science Course.

NJSLS - ELA/Literacy:

- 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)
- 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-PS4-3)

- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS4-3)
- 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)
- 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)
- 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)

- 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)
- 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.5.7 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)
- W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-1),(3-5-ETS1-3)

NJSLS - Mathematics:

- 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)
- 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-1),(4-PS4- 2)
- 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)
- 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)

- MP.2 Reason abstractly and quantitatively. (4-ESS3-1),(4-ESS3-2)
- MP.4 Model with mathematics. (4-ESS3-1),(4-ESS3-2)
- 4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3-1),(4-ESS3-2)
- 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)

The following NJSLS are covered in this particular science course:

21st Century Life and Careers - Career Ready Practices:

- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP7. Employ valid and reliable research strategies.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.

Technology:

- 8.1.5.A.1 Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
- 8.1.5.A.2 Format a document using a word processing application to enhance text and include graphics, symbols and/ or pictures.
- 8.1.5.A.3 Use a graphic organizer to organize information about problem or issue.
- 8.1.5.A.4 Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data.
- 8.1.5.A.5 Create and use a database to answer basic questions.
- 8.1.5.A.6 Export data from a database into a spreadsheet; analyze and produce a report that explains the analysis of the data.

4th Grade Science Curriculum Plan

Unit 7: Molecules to Organisms	Unit 3: Energy
LS1.A: Structure and Function Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.(4-LS1-1) **LS1.D: Information Processing** 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. (4-LS1-2)	**PS3.A: Definitions of Energy** The faster a given object is moving, the more energy it possesses.(4-PS3-1) Energy can be moved from place to place by moving objects or through sound, light, or electric currents.(4-PS3-2),(4-PS3-3) **PS3.B: Conservation of Energy and Energy Transfer** Energy is present whenever 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.(4-PS3-2),(4-PS3-3) Light also transfers energy from place to place.(4-PS3-2) 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. (4-PS3-2),(4-PS3-4) **PS3.C: Relationship Between Energy and Forces** When objects collide, the contact forces transfer energy so as to change the object's motions. (4-PS3-3)
Unit 4: Waves, Light & Information	**Unit 5: Energy & Natural Resources**
PS4.A: Wave Properties Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface	**ESS3.A:Natural Resources** Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple

of deep water, the water goes up and down in place; it does not move in the direction of the wave except when the water meets the beach (Note: This grade band endpoint was moved from K–2). (4-PS4-1) Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1) **PS4.B:Electromagnetic Radiation** An object can be seen when light reflected from its surface enters the eyes.(4-PS4-2) **PS4.C: Information Technologies and Instrumentation** Digitized information 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.(4-PS4-3) **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.(secondary to 4-PS4-3)	ways. Some resources are renewable over time, and others are not. (4-ESS3-1) **PS3.D: Energy in Chemical Processes and Everyday Life** The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4) **ETS1.A: Defining 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.(secondary to 4-PS3-4)
Unit 6: Natural Hazards	
ESS3.B:Natural Hazards 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.(4-ESS3-2)(Note: This Disciplinary Core Idea can also be found in3.WC.) **ETS1.B: Designing Solutions to Engineering Problems** Testing a solution involves investigating how well it performs under a range of likely conditions.(secondary to 4-ESS3-2)	

Unit 1 Molecules to Organisms			
Teacher:	**SBOE Faculty**	**Time Frame:**	33 days(Depending on individual teacher schedule)
Grade:	**4th Grade**	**School:**	SBOE
Subject:	**Elementary School Science**		
NJSLS - SCIENCE/**DCI**	LS1.A: Structure and Function Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1) LS1.D: Information Processing 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. (4-LS1-2)		
Instructional Objective: (condition, behavior, standard)	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.		

Essential Questions

(What questions will the student be able to answer as a result of the instruction?)

1. How does organism's structure fit its function?
2. How do internal and external structures function to support the survival of plants and animals?
3. How are instincts and learned behaviors beneficial to organisms?
4. How do senses function to help an animal's survival?
5. How are signals sent from receptors to the brain?

Knowledge & Skills

(What skills are needed to achieve the desired results?)

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● The core 4 function of organisms: growth, survival, behavior and reproduction.	● Analyze a plant or animal and explain how the internal and external features support their survival.

● Examples of how plant and animal structures, both internally and externally, function to fulfill life processes. ● The difference between instincts and behavior with examples. ● How senses benefit animals in respect to how they respond to their environment.	● Model how senses are used in respect to the brain in order to respond to their environment effectively. ● Use a model to describe that animals receive different types of information through their senses, process the information in their brains, and respond to the information in different ways.

Assessment

Acceptable evidence to show desired results

During the Smart Notebook lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work/homework questions and the SMART Response system. Classwork and Homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations listed below.

Lab: How do Plants Breathe?
Activity: Earthworms
Lab: African Violets
Activity: Internal Organ Systems
Quiz 1: Structure and Function
Quiz 2: Information Processing
Quiz 3: Receiving and Sending Signals

Suggested Sequence

Day	Topic	Classwork	Homework
1	Structure & Function	Slides 4-17; Classwork #1-3	Homework #4-7

2	Structure Fits Function	Slides 18-31 Classwork #8-13	Homework #14-18
3	Structure Fits Function	Lab: How do Plants Breathe?	N/A
4	Internal Structures	Slides 32-37 Set-up African Violets Lab	N/A
5	Internal Structures	Slides 38-41; Earthworm Activity	N/A
6	Internal Structures	Slides 42-48 Classwork #19-24	Homework #25-29
7	Internal Structures	Internal Organ System Activity	Study for quiz
8	Structure and Function	Quiz 1	N/A
9	Information Processing	Slides 49-56 Classwork #30-33	Homework #36-38
10	Information Processing	Slides 57-68 Classwork #34-35	Homework #39-40; Study for quiz
11	Information Processing	Quiz 2	N/A

12	Receiving and Sending Signals	Slides 69-83 Classwork #41-44	Homework #45-47; Study for quiz
13	Receiving and Sending Signals	Quiz 3	N/A
14	Unit Review	Review Game	Study Guide
15	Unit Test	Unit Test	N/A

*While there are many slides for each topic, several slides are interrelated and support each topic.

**HW Problems are currently not scaffolded from least to most difficult, but are instead listed in order of topic.

*** Lessons are based on 40 minute periods and may need to be adjusted to fit the schedule of your school.

Unit 2 Lesson Plan – Energy			
Teacher:	**SBOE Faculty**	**Time Frame:**	35 days (Depending on individual teacher schedule).
Grade:	**4**	**School:**	SBOE
Subject:	**Elementary School Science**		
NJSLS - SCIENCE/DCI **PS3.A: Definitions of Energy** **PS3.B: Conservation of Energy and Energy Transfer** **PS3.C: Relationship Between Energy and Forces**	**The faster a given object is moving, the more energy it possesses. (4-PS3-1)** **Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2) (4-PS3-3)** **Energy is present whenever 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. (4-PS3-2) (4-PS3-3)** **Light also transfers energy from place to place. (4-PS3-2)** **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. (4-PS3-2) (4-PS3-4)** **When objects collide, the contact forces transfer energy so as to change the object's' motions. (4-PS3- 3)** **http://www.nextgenscience.org/4e-energy**		

Instructional Objective: 4-PS3-1	**Use evidence to construct an explanation relation 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.**

Essential Questions

(What questions will the student be able to answer as a result of the instruction?)

6. What is energy?
7. What is the difference between kinetic and potential energy?
8. When do objects have more or less energy?
9. What are the various forms of energy?
10. How does energy shift between kinetic and potential?
11. How does energy transfer among the various forms of energy?
12. How does a collision transfer energy or force?
13. What is the law of conservation of energy?
14. What is force and how does it relate to energy?
15. What is direct and indirect force?

Knowledge & Skills	
(What skills are needed to achieve the desired results?)	
By the end of this unit, students will know: ● Energy is an objects' ability to do work. ● Energy can be kinetic or potential, and has many different forms. ● Energy shifts between kinetic and potential. ● Energy is not created or destroyed. ● Energy is transferred among its various forms. ● Force is a way that energy can be transferred.	By the end of this unit, students will be able to: ● Predict how changes in speed affect an object's energy. ● Observe how energy can be transferred among its various forms and explain what is happening using scientific vocabulary. ● Predict changes in energy that will occur as a result of objects colliding. ● Test and refine devices that convert energy from one form to another.
Assessment	
Acceptable evidence to show desired results	
During the Smart Notebook lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work/homework questions and the SMART Response system. Classwork and Homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations listed below. Lab 1: Pendulum Quiz 1: Energy Lab 2: Energy Transfer	

Quiz 2: Conservation of Energy and Energy Transfer

Lab 3:Heat Transfer

Quiz 3: Energy and Force

Performance Based Assessment

Unit Test

Suggested Sequence

Day	Topic	Classwork	Homework
1	What is Energy, Kinetic and Potential Energy	Slides 1 – 23; CW Questions 1 – 3	HW Question 7
2	Forms of Energy; Amounts of Energy	Slides 24 – 44; CW Questions 4 – 6	HW Questions 8 – 9
3	Forms of Energy	Slide 45 Pendulum Lab Notebook Build a Pendulum	N/A
4	Forms of Energy	Pendulum Lab Part A	N/A
5	Forms of Energy	Pendulum Lab Part B	Pendulum Lab Part C & Conclusion Questions
6	Forms of Energy	Pendulum Lab Part C & Conclusion Questions	Study for quiz

7	Energy; Energy Shifting	Energy Quiz; Slides 46 – 58	N/A
8	Energy Transfer; Conservation of Energy	Slides 59–77; CW Questions 10 – 12	HW Questions 13 – 16
9	Energy Transfer	Slide 78 Energy Transfer Lab	Lab Questions
10	Energy Transfer	Complete Energy Transfer Lab; Energy Transfer Worksheet	Study for quiz
11	Conservation of Energy and Energy Transfer; Energy and Force	Conservation of Energy and Energy Transfer Quiz; Slides 79-88; CW Questions 17-18	HW Questions 19-21
12	Energy Transfer	Slide 89; Heat Transfer Lab (Part 1)	Lab Questions
13	Energy Transfer	Heat Transfer Lab (Parts 2 & 3)	Conclusion Questions; Study for quiz
14	Energy and Force	Quiz	
15	Performance Assessment	Performance Assessment Task	

16	Unit Review	Review Game	Study for Test
17	Unit Test	Test	

*While there are many slides for each topic, several slides are interrelated and support each topic.

**HW Problems are currently not scaffolded from least to most difficult, but are instead listed in order of topic.

***Lessons are based on 40 minute periods and may need to be adjusted to fit the schedule of your school.

Unit 3 Lesson Plan – Waves, Light, & Information			
Teacher:	**SBOE Faculty**	**Time Frame:**	36 Days
Grade:	**4**	**School:**	SBOE
Subject:	**Elementary School Science**		
NJSLS - SCIENCE/DCI **PS4.A: Wave Properties** **PS4.B: Electromagnetic Radiation** **PS4.C: Information Technologies and Instrumentation** **ETS1.C: Optimizing The Design Solution**	**Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of 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. (4-PS4-1)** **Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1)** **An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2)** **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. (4-PS4-3)** **Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. *(secondary to 4-PS4-3)*** **http://www.nextgenscience.org/4w-waves** **http://www.nextgenscience.org/3sfip-stucture-function-information-processing**		
Instructional Objective:	**Develop a model of waves to describe patterns in terms of amplitude and wavelength and that**		

4-PS4-1	**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.**

Essential Questions

(What questions will the student be able to answer as a result of the instruction?)

16. What are waves and what are they caused by?
17. What words do scientists use to describe waves?
18. What are longitudinal waves and what causes them?
19. What are transverse waves and what causes them?
20. How are longitudinal and transverse waves different?
21. How does light allow us to see?
22. Why do we see colors?
23. How do plane mirrors reflect light and objects?
24. How is light refracted?
25. How do modern ways of communication utilize patterns to transfer information?

Knowledge & Skills	
(What skills are needed to achieve the desired results?)	
By the end of this unit, students will know: ● Waves are regular patterns of motion caused by a disturbance. ● In longitudinal waves, particles move in the same or opposite direction of the wave. ● In transverse waves, particles move up or down as the wave moves right or left. ● In order for us to see, light must reflect off of objects. ● We see colors when they are reflected and other colors are absorbed. When we see white, we are seeing all the colors reflected. When we see black, all the colors were absorbed. ● A plane mirror reflects light at the same angle it hits it and reflects an object the same distance away as it is from the mirror. ● Light bends as it passes from one material to another. ● Computers communicate using Binary, converting information into a list of 1's and 0's that relay information.	By the end of this unit, students will be able to: ● Create a wave and explain how to manipulate various characteristics of the wave (like amplitude or wavelength) ● Create a simple device to transfer sound waves and explain why it can do so. ● Relate amplitude and wavelength to volume and pitch. ● Model changes in amplitude and wavelength on a one-string guitar. ● Explain how mirrors reflect objects and light. ● Use patterns to create a code to transfer information. ● Decode a set of digitized information.

Assessment
Acceptable evidence to show desired results
During the Smart Notebook lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of classwork/homework questions and the SMART Response system. Classwork and Homework questions will be discussed as a class. Lab 1: Paper Wave Quiz 1: What are Waves? and Describing Waves Lab 2: Sound Cup Lab 3: One-String Guitar Quiz 2: Sight and Color Lab 4: Plane Mirror Lab 5: Light Reflection Quiz 3: Mirrors and Refraction Lab 6: Binary Code Quiz 4: Digitized Information Performance Based Assessment

Unit Test			
Suggested Sequence			
Day	**Topic**	**Classwork**	**Homework**
1	What are Waves?	Slides 1 - 16; CW #1 - 3	HW #4 - 6
2	Describing Waves	Slides 17-29	N/A
3	Describing Waves	Slides 30-52 CW #7	HW #8-12
4	Describing Waves	Slide 52 Paper Wavelab	Conclusion Questions; Study for quiz
5	What are Waves? and Describing Waves; Sound	What are Waves? And Describing Waves Quiz; Slides 53-69; CW #13 - 16	HW #17 - 18
6	Sound	Slides 70-71; Sound Cup Lab	Conclusion Questions
7	Sound	Slides 72-78; One String Guitar Lab	Conclusion Questions

8	Waves Summary; Sight and Color	Slides 79-81; Slides 82-96; CW #19 – 21, 24 - 26	HW #22 – 23, 27 - 29
9	Mirrors	Slides 97-98; Plane Mirror Lab	Study for quiz
10	Sight and Color; Mirrors	Sight and Color Quiz; Plane Mirror Lab Conclusion Questions	N/A
11	Mirrors	Slide 99 Light Reflection Lab	Conclusion Questions
12	Mirrors; Refraction	Slides 100-117; CW #30 – 31, 33	HW #32, 34 - 35
13	Digitized Information	Slides 118-130; CW #36 - 38	Study for quiz
14	Mirrors and Refraction	Mirrors and Refraction Quiz	HW #39-40
15	Digitized Information	Slide 131 Binary Code Lab	Conclusion Questions; Study for quiz
16	Digitized Information	Digitized Information Quiz	Study guide
17	Unit Test Review	Review Game	Study for Test

18	Unit Test	Test	

*While there are many slides for each topic, several slides are interrelated and support each topic.

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Unit 4 Lesson Plan – Energy and Natural Resources			
Teacher:	**SBOE Faculty**	**Time Frame:**	35 Days (Depending on individual teacher schedule)
Grade:	**4**	**School:**	SBOE
Subject:	**Elementary School Science**		
NJSLS - SCIENCE/DCI **ESS3.A: Natural Resources** **PS3.D: Energy in Chemical Processes and Everyday** **ETS1.A: Defining Engineering Problems**	**Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)** **The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4)** **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. (secondary to 4-PS3-4)** **http://www.nextgenscience.org/4e-energy**		
Instructional Objective: **4-ESS3-1** **4-PS3-4** **3-5-ETS1-1**	**Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.** **Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.**		

	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

Essential Questions

(What questions will the student be able to answer as a result of the instruction?)

26. Where do humans derive energy from?
27. What does it mean to produce energy?
28. How can energy be converted from one form to another?
29. What is renewable energy?
30. What is non-renewable energy?
31. How does human energy use impact the environment?

Knowledge & Skills

(What skills are needed to achieve the desired results?)

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● Humans use energy and fuels derived from natural sources. ● Producing energy refers to converting energy from one form to another so that it can be used for practical purposes. ● Devices must be designed, tested, and refined in order to convert energy. ● Renewable energy is energy that comes from	● Build a device that converts energy from one form to another by following instructions. ● Design and build a simple device that converts energy from one form to another. ● Define a simple engineering problem related to constraints due to materials, cost, or time. ● Explain one energy type in depth, including where the energy is found, what it is used for, and how it impacts the environment. ● Analyze a combination of information they have collected about one type of

a source that replenishes quickly and will not be used up before more is created. ● Non-renewable energy is energy that comes from a source that is very slow to replenish and can be used up. ● Human energy use has many impacts on the environment.	energy.

Assessment

Acceptable evidence to show desired results

During the Smart Notebook lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of classwork/homework questions and the SMART Response system. Classwork and Homework questions will be discussed as a class.

Quiz 1: Human Energy Use

Quiz 2: Renewable & Nonrenewable Energy

Activity 1: Solar Collector

Activity 2: Solar Sunflower

Lab 1: Design an Energy Device

Quiz 3: Environmental Impacts

Research Project

Performance Based Assessment (optional) Unit Test			
Suggested Sequence			
Day	**Topic**	**Classwork**	**Homework**
1	Human Energy Use	Slides 1 - 18; Human Energy Use Classwork	Human Energy Use Homework
2	Renewable Energy	Slides 19 - 38; Renewable Energy	Study for quiz
3	Human Energy Use; Renewable Energy	Quiz 1; Renewable Energy Classwork	Renewable Energy Homework
4	Non-Renewable Energy	Slides 39 - 53; Non-Renewable Energy Classwork	Non-Renewable Energy Homework; Study for quiz
5	Renewable & Nonrenewable Energy	Quiz 2; Slide 54; Review Solar Collector Activity; Complete Before You Begin section	N/A
6	Renewable & Nonrenewable Energy	Slide 54; Solar Collector Activity; Activity Questions	Conclusion Questions
7-8	Activity 2: Solar Sunflower	Slide 55; Activity Questions	Conclusion Questions

9-10	Lab 1: Design an Energy Device	Slide 56; Lab Questions	Conclusion Questions
11	Environmental Impacts	Slides 57 – 72; Environmental Impacts Classwork	Environmental Impacts Homework
12-13	Research Project	Slide 73; Research Project (notes, sources, research)	Study for quiz
14	Environmental Impacts	Quiz 3; Research Project (prepare for presentations)	Research Project Presentation
15	Environmental Impacts	Research Project presentations	Study Guide
16	Unit Test Review	Review Game	Study for Test
17	Unit Test	Test	

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Unit 5 Lesson Plan – Natural Hazards			
Teacher:	**SBOE**	**Time Frame:**	39 Days (Depending on individual teacher schedule).
Grade:	**4**	**School:**	SBOE
Subject:	**Elementary School Science**		
NJSLS - SCIENCE/DCI **ESS3.B: Natural Hazards** **ETS1.B: Designing Solutions to Engineering Problems**	**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. (4-ESS3-2)** **Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)**		
Instructional Objective: **4-ESS3-2**	**Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.**		
Essential Questions			
(What questions will the student be able to answer as a result of the instruction?)			
32. What is a natural hazard? 33. Can natural hazards be prevented? 34. How do earthquakes, volcanoes and tsunamis form? 35. How are earthquakes, volcanoes and tsunamis monitored? 36. How does earthquake engineering create earthquake resistant buildings?			

Knowledge & Skills	
(What skills are needed to achieve the desired results?)	
By the end of this unit, students will know: ● Natural hazards result from natural processes. ● Natural hazards cannot be prevented but their damage can be minimized. ● How plate tectonics lead to earthquakes, volcanoes and tsunamis. ● How scientists monitor and/or predict earthquakes, volcanoes and tsunamis. ● Building techniques that enable buildings - Science to resist earthquake and tsunami damage.	By the end of this unit, students will be able to: ● Describe natural hazards. ● Explain how earthquakes, volcanoes and tsunamis form. ● Describe the tools used to monitor earthquakes. ● Explain how a seismograph works. ● Describe how seismic, gas and ground deformation monitoring helps scientists to monitor/predict volcanoes. ● Describe how the DART system enables scientists to detect potential tsunamis. ● Design an earthquake resistant building.
Assessment	
Acceptable evidence to show desired results	
During the Smart Notebook lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of classwork/homework questions and the SMART Response system. Classwork and Homework questions will be discussed as a class. Design Challenge: Seismograph Quiz 1: Natural Hazards & Earthquakes	

Demo: Hotspots

Lab: Tsunami

Quiz 2: Volcanoes & Tsunamis

Lab: Shake It Up

Design Challenge: Earthquake Resistant Building

Unit Test

Performance Based Assessment (optional)

Suggested Sequence

Day	Topic	Classwork	Homework
1-2	Natural Hazards	Slides 4-19; Classwork #1	Homework #1
3	Earthquakes	Slides 20-36	N/A
4	Earthquakes	Slides 37-49; Classwork #2	Homework #2
5	Earthquakes	Slide 50 Design Challenge: Seismograph	Finish Lab questions

6	Volcanoes	Slides 51-61	Study for quiz
7	Natural Hazards & Earthquakes; Volcanoes	Quiz 1: Natural Hazards & Earthquakes; Slide 62 Demo: Hotspots	N/A
8	Volcanoes	Slides 63-76	N/A
9	Volcanoes	Slides 77-88	N/A
10	Volcanoes	Slides 89-92; Classwork #3	Homework #3
11	Tsunamis	Slides 93-103	N/A
12	Tsunamis	Slide 104 Lab: Tsunami	Finish lab questions
13	Tsunamis	Slides 105-112; Classwork #4	Homework #4
14	Minimizing Damage	Slides 113-124	Study for quiz
15	Volcanoes & Tsunamis; Minimizing Damage	Quiz 2: Volcanoes & Tsunamis; Slide 125 Begin Lab: Shake It Up	N/A
16	Minimizing Damage	Finish Shake It Up	Finish lab questions

17	Minimizing Damage	Slides 126-135	N/A
18-19	Minimizing Damage	Slide 136 Design Challenge: Earthquake Resistant Building	Finish Lab questions; Study Guide
20	Unit Review	Study Guide	Study for test
21	Unit Test	Unit Test	N/A

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