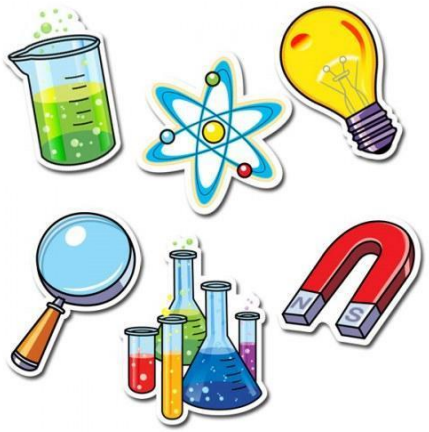
Secaucus Board of Education

8th Grade Science

Course Codes: 4810, 4820, 5829

Science Department



Born December 2016
Aligned to the NJSLS for Science (2014), ELA, Mathematics, Technology, and 21st Century Life and Careers
Approved by the Secaucus Board of Education on December 15, 2016

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

8th Grade Science Course Description and Levels

The Eighth 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 that are covered in the 8th grade include: Forces and Interactions, Energy, Natural Selection and Adaptation, History of Earth, and Human Impacts. All courses are designed to prepare students for The New Jersey Assessment of Skills and Knowledge – Science (NJ ASK 8 Science), their middle school and high school science courses, and potentially solving scientific problems and issues in their everyday lives.

Science 8, Inclusion

The material in the class is presented at a slower pace compared to the other courses offered in order to accommodate those students who have difficulty keeping up with the rate of a regular class. Concepts are covered not only at a slower pace, but also with more teacher support during hands-on activities and discussions. This class has an inclusion setting for those students who have an IEP, which may state that he or she requires in-class support of a special education teacher. As such, there is a special education teacher who team-teaches the class each day. Students who are placed in this course based on ESL placement will also receive accommodations based upon their ESL level

Science 8, Average

The material is presented at a moderate pace. Lessons are based on student- driven activities and discussions, which require the student to be a somewhat independent learner. Hands-on activities are meant to show connection 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

Science 8, Accelerated

This course is designed for those students who are more independent learners, and who have the ability to master concepts at a faster pace than that of the average student. Activities are modified to require more critical thinking and additional scientific process and concepts that are not touched upon in the average level class. Students who are placed in this course based on ESL placement will also receive

accommodations based upon their ESL level Students enrolled in this course are required to participate in the Secaucus Middle School Science Fair.

Science 8, Honors

This class is designed for those students who are exceptionally gifted. As with the accelerated class, material is presented at a much faster pace than the average classes. Students in this class are challenged with additional activities, readings, and discussions beyond that of the regular class in order to further promote and enhance higher-order thinking skills, and scientific processes. Students who are placed in this course based on ESL placement will also receive accommodations based upon their ESL level Students are required to participate in the Science Fair as well.

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 depict what standards align to the science standards taught in this 8th Grade Science Course.

NJSLS - ELA/Literacy:

- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS1-2),(MSPS1-3)
- RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)
- RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-1),(MS-PS1-2),(MS-PS1-4),(MS-PS1-5)
- WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS1-6)
- WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-PS1-3)
- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS3-1),(MSPS3-5)
- RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS3-3),(MS-PS3-4)
- RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-1)
- WHST.6-8.1 Write arguments focused on discipline content. (MS-PS3-5)
- WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS3-3),(MS-PS3-4)

- SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS3-2)
- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-3),(MS-LS1-4),(MS-LS1-5),(MS-LS1-6)
- RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-5),(MS-LS1-6)
- RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MSLS1-3),(MS-LS1-4)
- WHST.6-8.1 Write arguments focused on discipline content. (MS-LS1-3),(MS-LS1-4)
- WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS1-5),(MS-LS1-6)
- WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-LS1-1)
- WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-LS1-8)
- WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5),(MS-LS1-6)
- SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2),(MS-LS1-7)
- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS3-1),(MS-LS3-2)
- RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. (MS-LS3-1),(MS-LS3-2)
- RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS3-1),(MS-LS3-2)

- SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS3-1),(MS-LS3-2)
- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-LS4-1),(MSLS4-2),(MS-LS4-3),(MS-LS4-4),(MS-LS4-5)
- RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS4-1),(MS-LS4-3)
- RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-3),(MS-LS4-4)
- WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-2),(MS-LS4-4)
- WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-LS4-5)
- WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2),(MS-LS4-4)
- SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS4-2),(MS-LS4-4)
- SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS4-2),(MS-LS4-4)
- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)
- RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ETS1-3)
- RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ETS1-2),(MS-ETS1-3)
- WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ETS1-2)

- WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ETS1-1)
- WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2) SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ETS1-4)

NJSLS - Mathematics:

- MP.2 Reason abstractly and quantitatively. (MS-PS1-1),(MS-PS1-2),(MS-PS1-5)
- MP.4 Model with mathematics. (MS-PS1-1),(MS-PS1-5)
- 6. RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1),(MS-PS1-2),(MS-PS1-5) 6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS1-4)
- 8. EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. (MS-PS1-1)
- 6. SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots. (MS-PS1-2)
- 6.SP.B.5 Summarize numerical data sets in relation to their context (MS-PS1-2)
- MP.2 Reason abstractly and quantitatively. (MS-PS3-1),(MS-PS3-4),(MS-PS3-5)
- 6. RP.A.1 Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3-1),(MS-PS3-5)
- 6. RP.A.2 Understand the concept of a unit rate a/b associated with a ratio a: b with $b \neq 0$, and use rate language in the context of a ratio relationship. (MS-PS3-1)
- 7. RP.A.2 Recognize and represent proportional relationships between quantities. (MS-PS3-1),(MS-PS3-5)
- 8. EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1)

- 8. EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. (MS-PS3-1)
- 8. F.A.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS3-1),(MSPS3-5)
- 6. SP.B.5 Summarize numerical data sets in relation to their context. (MS-PS3-4)
- 6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1),(MS-LS1-2),(MS-LS1-3),(MS-LS1-6)
- 6. SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MSLS1-4),(MS-LS1-5)
- 6. SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4),(MS-LS1-5)
- MP.4 Model with mathematics. (MS-LS3-2)
- 6. SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS3-2)
- MP.4 Model with mathematics. (MS-LS4-6)
- 6. RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-LS4-4),(MS-LS4-6)
- 6. SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS4-4),(MS-LS4-6)
- 6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1),(MS-LS4-2)
- 7. RP.A.2 Recognize and represent proportional relationships between quantities. (MS-LS4-4),(MS-LS4-6)
- MP.2 Reason abstractly and quantitatively. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4)

- 7. EE.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)
- 7. SP Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. (MS-ETS1-4)

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:

- 8.1.8. A.1 Demonstrate knowledge of a real world problem using digital tools.
- 8.1.8. A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.
- 8.1.8. A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
- 8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results
- 8.1.8. A.5 Create a database query, sort and create a report and describe the process, and explain the report results.

8th Grade Science Curriculum Plan

Unit 1: Forces & Motion	Unit 2: Types of Interactions
PS2.A: Forces and Motion For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1) The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2) All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MS-PS2-2)	**PS2.B: Types of Interactions** Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3) Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4) Forces that act at a distance (electric and magnetic) can be explained by fields that extend through space and can be mapped by their effect on a test object (a ball, a charged object, or a magnet, respectively). (MS-PS2-5)
Unit 3: Energy of Objects in Motion	**Unit 4: Thermal Energy**
PS3.A: Definitions of Energy Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1) A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3 2) **PS3.B: Conservation of Energy and Energy Transfer**	**PS3.A: Definitions of Energy** Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3),(MS-PS3-4) **PS3.B: Conservation of Energy and Energy Transfer** The amount of energy transfer needed to change the

When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5)	temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4) Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3) **PS3.C: Relationship Between Energy and Forces** When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2) **ETS1.A: Defining and Delimiting an Engineering Problem** The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (secondary to MS-PS3-3) **ETS1.B: Developing Possible Solutions** A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (secondary to MS-PS3-3)
Unit 5: Wave Properties	**Unit 6: Electromagnetic Radiation**
PS4.A: Wave Properties A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1) A sound wave needs a medium through which it is transmitted.	**PS4.B: Electromagnetic Radiation** When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-2)

(MS-PS4-2)	The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (MS-PS4-2) A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS4-2) However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2)
Unit 7: Information Technologies & Instrumentation	
PS4.C: Information Technologies and Instrumentation Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3)	

Unit Lesson Plan - Forces and Motion			
Teacher:	SBOE Faculty	**Time Frame:**	**19 days (depending on individual teacher schedule)**
Grade:	**8th Grade**	**School:**	Middle School
Subject:	**Middle School Science**		
NJSLS/DCI MS-PS2: Forces and Interactions	**For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1)** **The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2)** **All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MS-PS2-2)** http://www.nextgenscience.org/msps2-motion-stability-forces-interactions		
Instructional Objective: MS-PS2-1.	**Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.**		
Instructional Objective: MS-PS2-2.	**Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.**		
Instructional Objective: MS-PS2-4.	**Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.**		
Essential Questions			
(What questions will the student be able to answer as a result of the instruction?)			

- What causes motion to occur?
- What do motion graphs look like for objects moving with constant velocity?
- What do graphs look like for objects that are accelerating?
- How is the speed of an object calculated?
- How is velocity similar / different from velocity?
- How is acceleration calculated?
- How do unbalanced forces affect the motion of an object?
- How does friction affect an object's when at rest or in motion?
- What are the biggest factors that affect the force of gravity?
- How is weight calculated?
- What does Newton's 1st law state about objects at rest or in motion?
- How does the mass of an object and the force acting on that object affect the object's acceleration?
- How can Newton's 3rd law of motion be used to explain the motion of a rocket?
- What factors affect the momentum of an object?
- How is momentum different from inertia?

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 causes of motion. ● The difference between speed and velocity. ● Unbalanced forces cause acceleration. ● The larger the force the larger the acceleration. ● The inverse relationship between mass and acceleration. ● Newton's 3rd law acts in force pairs.	● Interpret motion graphs ● Calculate speed. ● Calculate Weight. ● Calculate Force. ● Explain any moving object using Newton's Laws. ● Calculate momentum. ● Calculate basic sum of force problems.

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 embedded questions within the lesson. 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. Quiz 1: Motion Lab 1: Graphing Motion Simulation Lab 2: Constant Speed Graphical Analysis Lab 3: Accelerated Motion Using the Incline Plane Quiz 2: Graphing Motion Lab 4: Sticky Sneakers Quiz 3: Forces Lab 5: Forces and Friction Simulation Quiz 4: Newton's Laws Quiz 5: Newton's 3rd Law & Momentum Lab 6: Newton's Laws of Motion

Unit Test			
Suggested Sequence of Topics and Daily Activities			
Day	Topic	Classwork	Homework
1	Motion, Speed, and Velocity	SMART Notebook Slides 1-24 ; Questions #1-7	Questions #8-13
2	Average vs. Instantaneous Speed	Men's 100m Dash Activity Sheet	Questions #14-19 Study for Quiz
3	Motion Quiz Motion Graphs	Motion Quiz SMART Notebook Slides 25-32;	Questions #20-23
4	Graphing Motion	Graphing Motion Simulation	Finish Graphing Motion Simulation
5	Acceleration	SMART Notebook Slides 33-47; Questions #24-31	Questions #32-37
6	Constant Speed Graphical Analysis	Constant Speed Graphical Analysis Lab	Finish Lab Sheet
7	Accelerated Motion Using the Inclined Plane	Accelerated Motion Using the Inclined Plane Lab	Finish Lab Sheet Study for Quiz

8	Graphing Motion Quiz Forces and Friction	Graphing Motion Quiz SMART Notebook Slides 48-57; Questions #38-44	Questions #45-47
9	Gravity and Equilibrium	SMART Notebook Slides 68-83; Questions #48-54	Questions #55-62
10	Friction & Equilibrium	Sticky Sneakers Lab	Finish Lab Sheet Study for Quiz
11	Forces Quiz Newton's First Law	Forces Quiz SMART Notebook slides 84-98; Questions #63-66	Questions #67-69
12	Newton's Second Law	SMART Notebook Slides 99-106; Questions #70-75	Questions #76-81
13	Forces & Friction	Forces and Friction Simulation	Study for Quiz
14	Forces & Friction	Newton's Laws Quiz Complete Forces & Friction Simulation	
15	Newton's 3rd Law & Momentum	SMART Notebook Slides 107-127; Questions #82-90	Questions #91-97 Study for Quiz
16	Newton's Laws	3rd Law & Momentum Quiz	Finish Lab Questions for Stations 1-3

		Newton's Laws Lab Stations 1-3	
17	Newton's Laws Lab	Newton's Laws Lab Stations 4-8	Finish Lab Sheet Complete Study Guide
18	Test Review using Notebook	Study Guide Review	Study for Unit Test
19	Unit Test	Testing	

*While there are many slides for each topic, several slides within the notebook are hidden and won't be used during instructional time.
**HW Problems are currently not scaffolded from least to most difficult, but are instead listed in order of topic. Teacher should pay special attention at the end of each class period when assigning HW so that only problems related to the topic that was taught are being assigned.
***Pacing guide is based on 40 minute class periods, you will need to adjust based on your school's schedule.

Unit Lesson Plan - Types of Interactions			
Teacher:	**SBOE Faculty**	**Time Frame:**	21 days
Grade:	**8th Grade**	**School:**	Middle School
Subject:	**Middle School Science**		
NJSLS/DCI MS-PS2.B Types of Interactions	**Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3)** **Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.(MS-PS2-4)** **Forces that act at a distance(electric and magnetic) can be explained by fields that extend through space and can be mapped by their effect on a test object (a ball, a charged object, or a magnet, respectively).(MS-PS2-5)** http://www.nextgenscience.org/msps2-motion-stability-forces-interactions		
Instructional Objective: MS-PS2-3.	**Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.**		
Instructional Objective: MS-PS2-4.	**Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.**		
Instructional Objective: MS-PS2-5.	**Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.**		

Essential Questions	
(What questions will the student be able to answer as a result of the instruction?)	
● How are forces exerted over a distance? ● What causes a) gravitational field, b) electric field, and a c) magnetic field? ● What are the three types of fields discussed in this unit? How are they similar? How are they different? ● What happens to the strength of a field as we move farther away from its source?	
Knowledge & Skills	
(What skills are needed to achieve the desired results?)	
By the end of this unit, students will know: ● Source and factors that affect gravitation. ● Source and factors that affect electrical forces. ● Sources and factors that affect magnetic forces. ● The interrelationships between electricity & magnetism.	By the end of this unit, students will be able to: ● Differentiate between the transfers of force via direct contact vs. fields. ● Explain that mass and distance of separation affect the magnitude of gravitational attraction. ● Diagram/explain charge distribution in positive and negative objects. ● Sketch/explain electric fields. ● Explain that charge strength and distance of separation affect the magnitude of electrical forces. ● Diagram/explain the source of magnetism in terms of magnetic domains. ● Sketch/explain magnetic fields. ● Explain that magnetic strength and distance of separation affect the magnitude of magnetic forces. ● Identify the fact that moving electric charge produces magnetic fields and vice versa.

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: Gravity Simulation Lab Quiz 1: The Transfer of Forces Lab 2: Electrostatics Lab Lab 3: Electric Fields and Forces Simulation Quiz 2: Interactions Between Charges Lab 4: Magnetism Lab Lab 5: Magnetic Fields Simulation Quiz 3: Magnetic Forces and Fields Quiz 4: Electromagnetic Interactions Lab 6: Electromagnetism Lab Unit Test: Types of Interactions
Suggested Sequence of Topics and Daily Activities

Day	Topic	Classwork	Homework
1	Transfer of Force	Slides 4-13 ; CW Questions 1-4	HW Questions 5-7
2-3	Law of Gravitation	Slides 14-41; CW Questions 8-13	HW Questions 14-19
4	Law of Gravitation	Gravity Simulation Lab; Lab Worksheet	Finish Lab Sheet Study for Quiz
5	The Transfer of Forces	Quiz 1	N/A
6	Interactions of Electric Charge	Slides 42-50; CW Questions 20-23	HW Questions 24-26
7	Interactions of Electric Charge	Electrostatics Lab; Lab Worksheet	Finish Lab Sheet
8	Electric Forces	Slides 50-67 ; CW Questions 27-31	HW Questions 32-36
9	Electric Fields	Slides 68-76 ; CW Questions 37-39	HW Questions 39-42
10	Electric Fields	Electric Fields and Forces Simulation; Lab Worksheet	Finish Simulation Study for Quiz

11	Interactions Between Charges	Quiz 2	N/A
12	Magnetism	Slides 77-95 ; CW Questions 43-46	HW Questions 47-50
13	Magnetism Lab	Magnetism Lab; Lab Worksheet	Complete Magnetism Lab Worksheet
14	Magnetic Fields	Slides 96-116 ; CW Questions 51-53	HW Questions 54-55 Study for Quiz
15	Magnetic Fields	Magnetic Fields Simulation; Lab Worksheet	Finish Simulation; Study for Quiz
16	Magnetic Force and Field	Quiz 3	N/A
17	Electromagnetic Interactions	Slides 117-134; CW Questions 56-61	HW Questions 62-65 Study for Quiz
18	Electromagnetic Interactions	Electromagnetism Lab; Lab Worksheet	Finish EM Lab; Study for quiz
19	Electromagnetic Interactions	Quiz 4; Study guide	Complete Study Guide
20	MC Review for Test	MC response lesson (Study Guide notebook)	Study for test

21	Unit Test	Types of Interactions Test	

*While there are many slides for each topic, several slides within the notebook are hidden and won't be used during instructional time.
**HW Problems are currently not scaffolded from least to most difficult, but are instead listed in order of topic. Teacher should pay special attention at the end of each class period when assigning HW so that only problems related to the topic that was taught are being assigned.
***Pacing guide is based on 40 minute periods. You may need to adjust based on your school's schedule.

Unit Lesson Plan - Types of Interactions			
Teacher:	**SBOE Faculty**	**Time Frame:**	21 days
Grade:	**8th Grade**	**School:**	Middle School
Subject:	**Middle School Science**		
NJSLS/DCI MS-PS2.B Types of Interactions	**Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3)** **Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.(MS-PS2-4)** **Forces that act at a distance(electric and magnetic) can be explained by fields that extend through space and can be mapped by their effect on a test object (a ball, a charged object, or a magnet, respectively).(MS-PS2-5)** http://www.nextgenscience.org/msps2-motion-stability-forces-interactions		
Instructional Objective: MS-PS2-3.	**Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.**		
Instructional Objective: MS-PS2-4.	**Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.**		
Instructional Objective: MS-PS2-5.	**Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.**		

Essential Questions
(What questions will the student be able to answer as a result of the instruction?)
● How are forces exerted over a distance? ● What causes a) gravitational field, b) electric field, and a c) magnetic field? ● What are the three types of fields discussed in this unit? How are they similar? How are they different? ● What happens to the strength of a field as we move farther away from its source?

Knowledge & Skills	
(What skills are needed to achieve the desired results?)	
By the end of this unit, students will know: ● Source and factors that affect gravitation. ● Source and factors that affect electrical forces. ● Sources and factors that affect magnetic forces. ● The interrelationships between electricity & magnetism.	By the end of this unit, students will be able to: ● Differentiate between the transfers of force via direct contact vs. fields. ● Explain that mass and distance of separation affect the magnitude of gravitational attraction. ● Diagram/explain charge distribution in positive and negative objects. ● Sketch/explain electric fields. ● Explain that charge strength and distance of separation affect the magnitude of electrical forces. ● Diagram/explain the source of magnetism in terms of magnetic domains. ● Sketch/explain magnetic fields. ● Explain that magnetic strength and distance of separation affect the magnitude of magnetic forces. ● Identify the fact that moving electric charge produces magnetic fields and vice versa.

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: Gravity Simulation Lab Quiz 1: The Transfer of Forces Lab 2: Electrostatics Lab Lab 3: Electric Fields and Forces Simulation Quiz 2: Interactions Between Charges Lab 4: Magnetism Lab Lab 5: Magnetic Fields Simulation Quiz 3: Magnetic Forces and Fields Quiz 4: Electromagnetic Interactions Lab 6: Electromagnetism Lab Unit Test: Types of Interactions
Suggested Sequence of Topics and Daily Activities

Day	Topic	Classwork	Homework
1	Transfer of Force	Slides 4-13 ; CW Questions 1-4	HW Questions 5-7
2-3	Law of Gravitation	Slides 14-41; CW Questions 8-13	HW Questions 14-19
4	Law of Gravitation	Gravity Simulation Lab; Lab Worksheet	Finish Lab Sheet Study for Quiz
5	The Transfer of Forces	Quiz 1	N/A
6	Interactions of Electric Charge	Slides 42-50; CW Questions 20-23	HW Questions 24-26
7	Interactions of Electric Charge	Electrostatics Lab; Lab Worksheet	Finish Lab Sheet
8	Electric Forces	Slides 50-67 ; CW Questions 27-31	HW Questions 32-36
9	Electric Fields	Slides 68-76 ; CW Questions 37-39	HW Questions 39-42
10	Electric Fields	Electric Fields and Forces Simulation; Lab Worksheet	Finish Simulation Study for Quiz

11	Interactions Between Charges	Quiz 2	N/A
12	Magnetism	Slides 77-95 ; CW Questions 43-46	HW Questions 47-50
13	Magnetism Lab	Magnetism Lab; Lab Worksheet	Complete Magnetism Lab Worksheet
14	Magnetic Fields	Slides 96-116 ; CW Questions 51-53	HW Questions 54-55 Study for Quiz
15	Magnetic Fields	Magnetic Fields Simulation; Lab Worksheet	Finish Simulation; Study for Quiz
16	Magnetic Force and Field	Quiz 3	N/A
17	Electromagnetic Interactions	Slides 117-134; CW Questions 56-61	HW Questions 62-65 Study for Quiz
18	Electromagnetic Interactions	Electromagnetism Lab; Lab Worksheet	Finish EM Lab; Study for quiz
19	Electromagnetic Interactions	Quiz 4; Study guide	Complete Study Guide
20	MC Review for Test	MC response lesson (Study Guide notebook)	Study for test

21	Unit Test	Types of Interactions Test	

*While there are many slides for each topic, several slides within the notebook are hidden and won't be used during instructional time.
**HW Problems are currently not scaffolded from least to most difficult, but are instead listed in order of topic. Teacher should pay special attention at the end of each class period when assigning HW so that only problems related to the topic that was taught are being assigned.
***Pacing guide is based on 40 minute periods. You may need to adjust based on your school's schedule.

Unit Lesson Plan Thermal Energy			
Teacher:	SBOE Faculty	**Time Frame:**	26 days (depending on individual teacher schedule)
Grade:	**8th Grade**	**School:**	Middle School
Subject:	**Middle School Science**		
NJSLS/DCI **MS-PS3.A: Definitions of Energy**	**Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3),(MS-PS3-4)**		
MS-PS3.B: Conservation of Energy and Energy Transfer	**The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4)** **Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3)**		
MS-PS3.C: Relationship Between Energy and Forces	**When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2)** http://www.nextgenscience.org/msps3-energy		

Instructional Objective: MS-PS3-3	**Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.**
Instructional Objective: MS-PS3-4	**Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.**
Instructional Objective: MS-PS3-5	**Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.**

Essential Questions	
(What questions will the student be able to answer as a result of the instruction?)	
1. How is temperature related to kinetic energy? 2. What are three scales commonly used to measure temperature and how do they relate to one another? 3. Why do things feel hot or cold? 4. What is the definition of thermal energy and how does it relate to heat? 5. How do conductors and insulators differ? 6. What are the 1st and 2nd laws of thermodynamics? 7. What to heat engines do?	
Knowledge & Skills	
(What skills are needed to achieve the desired results?)	
By the end of this unit, students will know: ● The temperature of a substance is proportional to the *average* kinetic energy of the substance's molecules. ● Things expand when heated and contract when cooled due to the increase/decrease in kinetic energy. ● The three common scales to measure	By the end of this unit, students will be able to: ● Relate the motion and spacing of a substance's particles to the substance's temperature. ● Describe why object's expand or contract in terms of the temperature change of the object as well as the motion of the object's particles. ● Measure a substance's temperature using a standard thermometer and convert between Kelvin, Celsius and Fahrenheit. ● Relate thermal expansion/contraction to how thermometers work. ● Identify when substances can have the same temperature but possess different

temperature (Kelvin, Celsius, and Fahrenheit) ● The difference between temperature and thermal energy ● Three methods of heat transfer: convection, conduction and radiation ● How conductors and insulators differ ● The direction of heat flow and the 2nd law of thermodynamics. ● The variables that affect temperature change in an object. ● The definition of specific heat (capacity). ● The 1st law of thermodynamics and how it relates to energy ● What heat engines do	amounts of thermal energy. ● Differentiate between examples of convection, conduction and radiation. ● Use their knowledge of conductors and insulators to maximize and minimize thermal energy transfer. ● Determine temperature changes between two objects that exchange thermal energy. ● Be able to describe what happens to usable energy in a system. ● Describe the relationship between energy transferred, type/amount of matter, and temperature. ● Use the thermal energy/specific heat equation to calculate: temperature change, heat added or lost, mass of objects, and specific heats. ● Determine qualitatively the relative temperature of objects given a heat input and the objects' specific heat capacity. ● Describe examples of the 1st law of thermodynamics ● Identify examples of heat engines, specifically an internal combustion engine.

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 embedded questions with the lesson. 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: Temperature and KE Lab

Quiz 1: Temperature and Kinetic Energy Quiz

Lab 2: Thermal Energy Transfer

Lab 3: Conductors and Insulators

Quiz 2: Thermal Energy Transfer Part I

Lab 4: Thermal Energy Transfer II

Quiz 3: Thermal Energy Transfer Part II

Lab 5: Thermodynamics

Quiz 4: Thermodynamics

Unit Test: Thermal Energy

Suggested Sequence of Topics and Daily Activities

Day	Topic	Classwork	Homework
1-2	Temperature and Kinetic Energy	Slides 5-14 CW 1 (part I and part II)	Finish Classwork Part I and II
3	Temperature and Kinetic Energy	Lab 1 (part I) Slides 15-26	Start HW#1 (due after completing all three parts of lab 1)

4-6	Temperature and Kinetic Energy	Lab 1 (part II) CW 1 (part III) Lab 1 (Part III)	Continue working on HW #1 Study for Quiz
7	Temperature and Kinetic Energy	Class discussion of lab activities/answers. Quiz #1	
8	Thermal Energy	Slides 27-34 CW 2	Start HW #2 (due after completing ….)
9	Heat	Inquiry Lab 2 (part I) Slides 35-41	Continue HW#2
10	Energy Transfer	Finish slides 42-48 Lab 2(Part II)	Continue HW#2 Complete Lab 2 analysis if needed
11-13	Energy Transfer	Slides 48-62 CW 3 Lab 3	Finish HW#2
14	Conductors/Insulators	Slides 63-69 CW 4	HW #3 Study for Quiz
15-16	Specific Heat	Quiz #2 Lab 4 (Part I)	Complete experimental design

17	Energy Transfer	Hot and Cold Cans competition	Complete analysis & results
18-20	Specific Heat	Finish Lab 4 (Part I-III) Slides 70-86 (concurrently with lab as different parts are finished)	Complete Lab Analysis for each part as it is done in class
21	Specific Heat	Slides 88-92 CW 5	HW#4 Study for quiz
22	Thermodynamics	Quiz #3 Slides 93-104	HW #5
23	Thermodynamics	Finish Slides Lab 5 (short)	Finish lab analysis questions
24	Thermodynamics	CW6	Study for Quiz Complete Study Guide
25	Thermodynamics/ Review	Quiz #4 Review Study Guide	Study for Test
26	Thermal Energy	Unit Test	

*While there are many slides for each topic, several slides within the notebook are hidden and won't be used during instructional time.

**HW Problems are currently not scaffolded from least to most difficult, but are instead listed in order of topic. Teacher should pay special attention at the end of each class period when assigning HW so that only problems related to the topic that was taught are being assigned.
***Pacing guide is based on 40 minute periods, you may need to adjust based on your school's schedule.

Unit Lesson Plan - Wave Properties			
Teacher:	SBOE Faculty	**Time Frame:**	14 Days (depending on individual teacher schedule)
Grade:	**8th Grade**	**School:**	Middle School
Subject:	**Middle School Science**		
NJSLS/DCI: **MS-PS4. Wave Properties**	**PS4.A:Wave Properties** **A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.(MS-PS4-1)** **A sound wave needs a medium through which it is transmitted. (MS-PS4-2)**		
Instructional Objective: MS-PS4-1.	**Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.**		
Instructional Objective: MS-PS4-2.	**Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials**		
Essential Questions			
(What questions will the student be able to answer as a result of the instruction?)			
● **What causes a wave?** ● **What are the basic "parts" of a wave?** ● **What are the properties that all waves exhibit?**			

- **What is a mechanical wave?**
- **How do pitch and loudness correspond to the structure of a wave?**
- **How does the Human ear detect sound?**
- **What happens to the pitch of a sound wave when the sound source is in motion?**
- **What happens to the sound waves of a plane that travels faster than the speed of sound?**

Knowledge & Skills	
(What skills are needed to achieve the desired results?)	
By the end of this unit, students will know: ● The source of waves ● The parts of a wave including wavelength, amplitude, frequency, crest, trough, and equilibrium position. ● The calculation of a wave's velocity. ● How pitch and loudness are a function of a wave's structure. ● The behavior of waves according to the law of reflection. ● The speed and direction of a wave changes when it undergoes refraction. ● Waves spread out as they pass through an opening during diffraction. ● Waves can add up to become stronger and cancel each other out during constructive and destructive interference. ● Sound is caused by a vibrating object	By the end of this unit, students will be able to: ● Describe the source of a wave. ● Label diagrams of basic sound waves. ● Calculated the velocity of a wave utilizing the wave equation. ● Label and explain diagrams of refraction. ● Label and explain diagrams of diffraction. ● Sketch and explain constructive and destructive interference. ● Describe the source of a longitudinal sound wave as cause by a vibrating object. ● Label longitudinal waves parts including compressions and rarefactions and relate a vibrating object to the source of each part. ● Relate the frequency of a sound wave to the observed pitch of that wave. ● Relate the amplitude of a sound wave to the observed loudness of that wave. ● Describe the basics of hearing and the structure of the outer, middle, and inner ear. ● Describe how the speed of sound is affected on warmer and cooler days. ● Describe the observed pitch that originates from a moving sound source. ● Describe the arrangement of sound waves produced when a sound source is moving faster than the speed of sound.

and requires a medium to move. ● Smaller objects produce higher pitched sounds. ● Loudness is a measure of the amplitude of a wave and is measured in decibels. ● Sound waves vibrate parts of the ear and the ear sends that information to the brain during hearing. ● The speed of sound varies in air according to the temperature of the air. ● The pitch of a sound wave is affected by a sound source in motion and this is called the Doppler Effect.	
Assessment	
Acceptable evidence to show desired results Quiz 1 – What is a wave Lab 1 – Slinky Lab Quiz 2- Parts of a wave/Wave equation Quiz 3 – Properties of Waves Lab 2- Tuning Fork Lab Simulation 1 – The Doppler Effect Quiz 4- Sound Test – Wave Properties	
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 embedded questions within the lesson. 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.	
Suggested Sequence of Topics and Daily Activities	

Day	Topic	Classwork	Homework
1	What are waves?	SMART Notebook Slides 2-22: Day 1 CW Questions WS	Day 1 HW Questions WS
2	Quiz #1 & Slinky Lab	Quiz #1 & Lab- Slinky Lab WS	Finish Slinky lab WS
3	Parts of a wave	SMART Notebook Slides 23-35: Day 2 CW Questions WS	Day 2 HW Questions WS
4	The Wave Equation	SMART Notebook Slides 36-46: Day 3 CW Questions WS	Day 3 HW Questions WS
5	Quiz #2 & Properties of waves	Quiz #2 & SMART Notebook Slides 47-67: Day 4 CW Questions WS	Day 4 HW Questions WS
6	Quiz #3 & Sound as a Wave	Quiz #3 & SMART Notebook Slides 55-68: Day 5 CW Questions WS	Day 5 HW Questions WS
7	Sound as a Mechanical Wave	SMART Notebook Slides 69-78: Day 6 CW Questions WS	Day 6 HW Questions WS
8	Properties of Sound waves	SMART Notebook Slides 79--90: Day 7 CW Questions WS	Day 7 HW Questions WS

9	Tuning Fork Lab	Lab – Tuning Forks Lab Sheet	Finish Tuning Forks Lab Sheet
10	The Doppler Effect	SMART Notebook Slides 91-124: Day 8 CW Questions WS	Day 8 HW Questions WS
11	Quiz #4 & Doppler Effect Simulation	Quiz #4 & Doppler Effect Simulation WS	Finish Doppler Effect Simulation WS& Study Guide
12	MC Review for Test & Review Study Guide	MC response lessons & review Free response from Study Guide	STUDY
13	Unit Test	Testing & Wave Properties Test	N/A

*While there are many slides for each topic, several slides within the notebook are hidden and won't be used during instructional time.
**HW Problems are currently not scaffolded from least to most difficult, but are instead listed in order of topic. Teacher should pay special attention at the end of each class period when assigning HW so that only problems related to the topic that was taught are being assigned.

Unit Lesson Plan – Electromagnetic Radiation			
Teacher:	**SBOE Faculty**	**Time Frame:**	18 Days (depending on individual teacher schedule)
Grade:	**8**	**School:**	Middle School
Subject:	**Middle School Science**		
NJSLS/DCI MS-PS4-B Electromagnetic Radiation	**When light shines on an object, it is reflected, absorbed or transmitted through the object, depending on the object's material and the frequency (color) of the light.** **The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g. air and water, air and glass) where the light path bends.** **A wave model of light is useful for explaining brightness, color and the frequency-dependent bending of light at a surface between media.** **However, because light can travel through space, it cannot be a matter wave, like sound or water waves.** **http://www.nextgenscience.org/***		
Instructional Objective: MS-PS4-2	**Develop and use a model to describe that waves are reflected, absorbed or transmitted through various materials.**		
Essential Questions			
(What questions will the student be able to answer as a result of the instruction?)			

1. What is radiation?
2. How are light waves and mechanical waves different?
3. What is the relationship between wavelength, frequency and energy of electromagnetic radiation?
4. What are the different types of electromagnetic radiation?
5. What are the different types of reflection?
6. How does the absorption of light result in the different colors that we see?
7. How do objects refract through different mediums?

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:
● How electromagnetic radiation acts as a wave ● The different types of electromagnetic radiation that compose the electromagnetic spectrum ● The different interactions of radiation with matter, including reflection, absorption and refraction ● How we perceive different colors	● Complete calculations based on wavelength, frequency and energy ● Differentiate between the different properties and uses of electromagnetic radiation ● Compare and contrast specular and diffuse reflection ● Explain how absorption results in changes in temperature of objects and different perceived colors ● Explain how refraction occurs and estimate angles of reflection and refraction

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 embedded questions within the lesson. Classwork and Homework questions will be discussed as a class. Lab 1: Light Intensity versus Distance Quiz 1: Electromagnetic Radiation Lab 2: Scaling the Electromagnetic Spectrum Quiz 2: Electromagnetic Spectrum Lab 3: Spectroscopy Lab 4: Bending of Light Virtual Lab Lab 5: Intensity of Refracted Light Virtual Lab Quiz 3: Interactions with Matter Unit Test
Suggested Sequence of Topics and Daily Activities

Day	Topic	Classwork	Homework
1-2	What is Electromagnetic Radiation?	Slides 4-27; CW #1-8	HW #9-14
3	What is Electromagnetic Radiation?	Lab 1: Light Intensity versus Distance	Finish Lab Questions
4	The Electromagnetic Spectrum	Slides 28-50	Study for quiz
5	What is Electromagnetic Radiation?; The Electromagnetic Spectrum	Quiz 1; Slides 50-60	N/A
5	The Electromagnetic Spectrum	Slides 61-85	N/A
6	The Electromagnetic Spectrum	Slides 86-92; CW #15-21	HW #22-27
7	The Electromagnetic Spectrum	Lab 2: Scaling the Electromagnetic Spectrum	Finish Lab Questions
8	Interactions with Matter	Slides 93-106	N/A
9	Interactions with Matter	Slides 107-108; Lab 3: Spectroscopy	Finish Lab Questions; Study for quiz
10	The Electromagnetic Spectrum	Quiz 2; Slides 109-114	N/A

12	Interactions with Matter	Slides 115-127; CW #28-35	HW #36-40
13	Interactions with Matter	Lab 4: Bending of Light Virtual Lab	Finish Lab Questions
14	Interactions with Matter	Lab 5: Intensity of Refracted Light Virtual Lab	Finish Lab Questions
15	Interactions with Matter	Slides 128-134; Review for quiz	Study for quiz
16	Interactions with Matter	Quiz 3; Study Guide	Study Guide
17	Unit Review	Unit Review	Study for Test
18	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. Teacher should pay special attention at the end of each class period when assigning HW so that only problems related to the topic that was taught are being assigned

Unit Lesson Plan: Information Technologies and Instrumentation			
Teacher:	**SBOE Faculty**	**Time Frame:**	7 days (depending on individual teacher schedule)
Grade:	**8th Grade**	**School:**	Middle School
Subject:	**Middle School Science**		
NJSLS/DCI MS-PS4.C: Information Technologies and Instrumentation	**Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information (MS-PS4-3)** http://www.nextgenscience.org/msps4-waves-applications-technologies-information-transfer		
Instructional Objective: MS-PS4-3	**Integrate qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses) are a MORE RELIABLE way to encode and transmit information.**		
Essential Questions			
(What questions will the student be able to answer as a result of the instruction?)			
8. What are older, less reliable methods of communication? 9. What are the advantages of using digitized signals (electromagnetic waves) for communication over older methods? 10. Why are electromagnetic waves a more reliable method for transmitting information? 11. Which waves on the electromagnetic spectrum are primarily used for communication? 12. How are radio and light waves used for communication? What are some examples of items that use these forms of EM waves for communication? 13. Why is digital communication of information in society?			

<table>
<tr><th colspan="2">Knowledge & Skills</th></tr>
<tr><td colspan="2">(What skills are needed to achieve the desired results?)</td></tr>
<tr><td>By the end of this unit, students will know:
Older methods of long distance communication
Why using EM waves for communication is more reliable
Identify the waves on the EM spectrum that are used primarily for communication
Identify items that use EM waves for communication
The role of communication technology in society</td><td>By the end of this unit, students will be able to:
Describe how the basics of how a telegraph and telephone work
Explain the advantages of using digital communication over older forms of communication
Describe how characteristics of EM waves help make it reliable form of communication
List items that either use radio or light waves for communication
Explain generally how fiber optics are used for communication
Analyze the importance of communication technology in society
Recognize that communication technology is not always positive</td></tr>
<tr><th colspan="2">Assessment</th></tr>
<tr><td colspan="2">Acceptable evidence to show desired results</td></tr>
<tr><td colspan="2">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 embedded questions within the lesson. 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: Build an Electric Telegraph
Quiz 1
Test</td></tr>
</table>

Suggested Sequence of Topics and Daily Activities			
Day	Topic	Classwork	Homework
1	History of Technology in Communication	Slides 1-9 Lab 1: Build an Electric Telegraph	HW: Finish Lab questions
2	EM waves and communication	Slides 10-21 CW: Build a Simple Radio	HW: Finish Lab questions
3	EM waves and communication	Slides 22-30 Quiz 1	
4	EM waves and communication	Slides 31-43	
5	Electronic Technology and importance in Society	Finish slides from yesterday if needed CW 2: Communication Technologies in Society	HW: start study guide

6	Review	Finish CW 2 and present Review for Test	
7		TEST	

*While there are many slides for each topic, several slides within the notebook are hidden and won't be used during instructional time.
**HW Problems are currently not scaffolded from least to most difficult, but are instead listed in order of topic. Teacher should pay special attention at the end of each class period when assigning HW so that only problems related to the topic that was taught are being assigned.
***Pacing guide is based on 40 minute periods, you may need to adjust based on your school's schedule.