SCN885 Science Advanced 8 (AA-CCPC)

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STATEMENT OF PURPOSE

In 2014, the New Jersey State Department of Education adopted the New Jersey Student Learning Standards for Science which set forth a vision of science education that integrates Science and Engineering Practices (SEPs), Crosscutting Concepts (CCCs) and Disciplinary Core Ideas (DCIs) into a three dimensional learning environment for all students. The Grade Eight Course of Study is effectively designed to provide the students with a rigorous and challenging science experience, and afford each student an opportunity to strengthen his or her scientific knowledge and skill-base. The emphasis is placed on building a genuine big picture understanding of the concepts being studied throughout the year. The program is designed to address the needs of all students, regardless of how successful their learning may have been in the past. It incorporates an interactive approach that develops student skills in critical thinking, scientific knowledge and problem-solving skills. The curriculum employs methods that afford the students the opportunity to develops hands on skills in the Practices and establish criteria they will utilize to undertake the conceptual and laboratory experiences he or she will regularly encounter.

Reading, writing and mathematical computational skills will be also be developed, and employed in various aspects of the learning including laboratory report and conclusion statement writing.

Formative assessments are continually offered to students in order to provide each individual with a solid framework from which to build a unified, cohesive understanding of the scientific concepts being studied and skills being developed. Summative assessments are given only after students have been given an opportunity to explore and refine their conceptual understanding. The Grade 8 Science curriculum includes principles of physical, life and earth science, building upon knowledge gained in the 6^{th} and 7^{th} grade classes. Separately we assess students to gauge progress and inform instruction for students in grades 6 through 8 are administered once per quarter.

RATIONALE

The Grade Eight Physical Science Curriculum is effectively designed to afford each student an opportunity to strengthen his or her scientific knowledge and skill-base. The emphasis is placed on building a genuine big picture understanding of the concepts being studied throughout the year. The program is designed to address the needs of all students, regardless of how successful their learning may have been in the past.

This course is aligned with the New Jersey Student Learning Standards for Science (also known as the Next Generation Science Standards (NGSS), the Science and Engineering Practices (SEP's) the New Jersey Student Learning Standards for Technological Literacy, and the New Jersey 21st Century Life and Career Ready Practices. Using a variety of materials, resources, and instructional

methods, the course reinforces the educational skills of scientific interpretation, investigation, problem-solving, critical analysis and research. District initiatives in assessment and critical reading and writing are emphasized.

THE LIVING CURRICULUM

Curriculum guides are designed to be working documents. Teachers are encouraged to make notes in the margins. Written comments can serve as the basis for future revisions. In addition, the teachers and administrators are invited to discuss elements of the guides as implemented in the classroom and to work collaboratively to develop recommendations for curriculum reforms as needed.

AFFIRMATIVE ACTION

During the development of this course of study, particular attention was paid to material, which might discriminate on the basis of sex, race, religion, national origin, or creed. Every effort has been made to uphold both the letter and spirit of affirmative action mandates as applied to the content, the texts and the instruction inherent in this course.

MODIFICATIONS AND ADAPTATIONS: For guidelines on how to modify and adapt curricula to best meet the needs of all students, instructional staff should refer to the Curriculum Modifications and Adaptations (http://njcdd.org/wp-content/uploads/2016/08/tools-teacherspart2.pdf). Instructional staff of students with Individualized Education Plans (IEPs) must adhere to the recommended modifications outlined in each individual plan.

GENERAL GOALS

The students will:

- investigate the evidence that relates the origin/evolution of the universe to the Law of Conservation of Mass.
- identify and describe the physical and chemical properties of matter, which may undergo change.
- learn that atoms are composed of small particles that determine their properties.
- investigate how elements are organized on the periodic table in order to understand that substances undergo chemical reactions which form new substances whose properties are different from the original substance.
- investigate how energy can be changed from one form to another, but cannot be created or destroyed.
- explore how matter exists in various states, which are determined by the movement of the particles.
- identify forces that act on objects, and determine how they can produce motion.

- take an active role in the acquisition of Science knowledge, skills and practices.
- develop strong problem-solving and critical thinking skills.

GENERAL PERSONAL SAFETY

The science classroom contains potential dangers that are easily avoided when both the teacher and all students have a thorough knowledge of the potential hazards, exercise prudent care and foresight, and use of common sense. Accident prevention must be included in the performance of every task, and safety instruction must be an integral part of the overall science program.

1. Precautions should be taken to protect those in the classroom from injury from hot or corrosive materials.

a. In order to reduce the danger from caustic or hot liquids, students and teachers handling such materials should wear protective aprons (plastic or neoprene), goggles and should roll sleeves (which can absorb the liquid) tightly to above the elbow.

b. Students should never be permitted to work with concentrated acids or bases.

c. Burns from either hot or caustic materials should be flooded immediately ad for at least ten minutes with copious amounts of cold water. Following flooding of the burn, the victim should be escorted to the school nurse as quickly as possible. Clothing which has absorbed caustic materials should be

removed as soon as feasible. The school nurse should be called immediately.

2. Eating anything in the laboratory should be prohibited since it entails an intolerable hazard from toxic materials.

3. Cleanliness and order should be maintained.

a. Extraneous objects should be moved from work surface. Accidents tend to be intensified by clutter.

b. Glassware and other hardware should be maintained in a clean condition. Chemical residues may constitute a reactive hazard.

c. Students should be required to thoroughly wash their hands with soap and water following a laboratory session.

4. There are several devices for protecting students and instructors against the corrosive or toxic effects of chemical reagents.

a. Aprons should be worn by all students working in a laboratory, especially when working with corrosive reagents.

b. Gloves should be worn by students when working with concentrated corrosive reagents. Gloves have a tendency to reduce dexterity, which may be a hazard in itself. Gloves are generally rubber or plastic.

c. Long hair can be a serious hazard in the laboratory and should be covered or contained. Fire and reduced visibility are just two of the hazards that result from long hair.

d. Loose clothing is another potential hazard in the laboratory. Loose clothing is less controllable that tight-fitting clothing. Glassware can be knocked off benches, clothing can come into contact with open flame and manual dexterity can be reduced.

5. In a demonstration experiment using any flammable liquid such as alcohol, care must be taken to ensure that any flame in the room is a safe distance from the volatile liquid.

6. Demonstrations involving explosive or potentially explosive substances must be so arranged as to shield everyone from any danger. Use the safety shield to protect observers and the face shield and goggles to protect the demonstrators. Size of apparatus and quantities of reagents used in

demonstration should be consistent with safe practice.

7. Observers should be evacuated from seats directly in front of the demonstration table, even if the possibility is remote that injury to them might occur from splattering of chemicals, inhalation of fumes, etc.

8. All persons performing science activities involving hazards to the eyes must wear approved eye protection devices. All persons in dangerous proximity must likewise be equipped.

9. Chemicals should never be tasted (or placed on the tongue or lips) nor should laboratory glassware be used as drinking vessels.

10. Sandals and open-toe shoes should not be permitted in laboratory areas unless they have a protective covering.

SAFETY CHECKLIST FOR TEACHERS

1. _____ Do you brief your students concerning safety procedures prior to each laboratory.

2. _____ Is there a copy of student safety guidelines posted in the lab? Are students familiar with the contents and know how to use it?

3. _____ Have the students received a copy of safety procedures? Are the students required to keep the procedures in their notebooks for easy reference?

4. _____ Are you present at all times when students are working in a classroom or laboratory? Lab work should never be done without supervision.

5. _____ Do you emphasize the importance of traits and attitudes concerning observation, precision, and alertness?

6. _____ Do your students follow a procedure for checking out the laboratory at the end of a class or the school day?

7. _____ Are the students aware that it is unsafe to touch the face, mouth, eyes and other parts of the body while working in a laboratory situation?

8. _____ Do you know where the safety features of this room are located?

9. _____ Is everything stored in easily handled, labeled containers? This includes water (tap and distilled) and waste materials.

10. _____ Have students obtained ALL the equipment they will need before beginning lab work?

11. _____ Are commercial spill kits or other materials available to control spills?

12. _____ Do you know where the safety features of this room are located?

13._____ Have you inspected all glassware for cracks or defects?

14._____ If glassware is to be heated, do you make sure it is Pyrex?

15._____ Do students know how to dispose of broken glassware?

16._____ Do you allow time for students to clean their equipment and area properly?

17._____ Do you insist that the students wear goggles when heating materials and/or working with chemicals:

18._____ Do you keep flame far from flammable liquids?

19._____ Do you and your students wear all necessary protective clothing?

20._____ Do you insist that students NOT eat, drink, chew gum, or apply cosmetics in the lab area?

21._____ Are students thoroughly familiar with the operation of the equipment before they begin the experiment?

22._____ Have you checked all electrical connections BEFORE turning on the current?

23._____ Have you discussed with all your students their responsibilities in the laboratory?

MARKING PERIOD GRADES

Long and Short Term Assessments which may include: 90%

- Tests, quizzes, and/or worksheets
- Authentic assessments
- Technology applications
- Projects, reports, presentations
- Laboratory investigations
- Data Analysis
- Analysis of assigned readings

Daily Assessments which may include: 10%

- Active engagement in class activities
- Demonstration of knowledge and understanding of course material
- Skills and safety practices during lab investigations
- Do Now/Exit Questions
- Homework

Class type

Assessment

FINAL GRADE ASSESSMENT

5 day/week required courses

Quarterly assessment

Quarterly assessments will take place at the end of each marking period, and will be counted as a major assessment for the marking period, similar to a unit assessment. No more than 2 assessments will be administered per day during quarterlies and semesterlies.

COURSE PROFICIENCIES

In accordance with district policy as mandated by the New Jersey Administrative Code and the New Jersey Core Curriculum Content Standards, the following are proficiencies required for the successful completion of the above named course.

The student will:

1. Collect and interpret data regarding their preferences for learning.

2. Compare and contrast scientific method and engineering design process and appropriate vocabulary.
3. Contribute to a team/group in a collaborative/cooperative dynamic.
4. Define the word *synthetic* as the result of a chemical process.
5. Identify the biotic and abiotic factors in an ecosystem.
6. Demonstrate how matter and energy are cycled within an environment due to the laws of conservation.
7. Construct and interpret graphical data to describe relationships of Kinetic Energy (KE) to the mass and speed of an object.
8. Develop a model to describe that as the arrangement of objects interacting at a distance changes (GPE for example) different amounts of Potential Energy (PE) are stored in the system.
9. Support the claim that when the kinetic energy of an object changes, energy has been transferred to or from that object.
10. Use visual and 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.
11. Develop a product to prove that waves are reflected, absorbed, or transmitted through various mediums.
12. Recognize how information is sent and received (i.e. fiber optics/light, radio waves for WiFi and binary code for sound and text on screens.
13. Plan an experimental investigation that generates evidence that an object's change in motion is dependent on the sum of forces acting on the object as well as it's mass (Newton's 1st and 2nd Laws).
14. Apply understanding of Newton's 3rd Law to a design solution addressing the collision of two objects in one dimension.
15. Construct and present arguments using evidence to support the claim that gravitational attractions are dependent on both the mass of and distance between objects.
16. Conduct an investigation and evaluate the experimental design to provide qualitative evidence that both electric and magnetic fields exist between objects that are not actually in contact.
17. Predict and describe the changes in particle motion, temperature, and state when thermal energy is either added or removed from a pure substance.
18. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
19. Observe and identify the physical and chemical properties of reactants to determine if chemical changes have occurred when various types of matter interact.
20. Develop models to describe the atomic composition of simple molecules and utilize those molecules to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
21. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
22. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
23. Use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
24. Determine the formation/cause/cycles of various natural resources and how they are utilized by humans.
25. Measure various testable quantities of materials found in the local water cycle/environment that are indicators of human impact on ecosystems.

26. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century as well as construct arguments supported by evidence that increases in human populations and/or consumption of natural resources impact Earth’s systems.

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Unit	Essential Questions	Enduring Understanding	Suggested Activities	Evaluation / Assessment	Resources
Evidence Based Learning in Science *(Week 1, 2 Weeks)*	a) How does data inform the type of learner that I am? b) What is difference between the scientific method and engineering design process?	a) Scientific data/observations are generated and analyzed to draw evidence based conclusions. b) Scientific method answers questions while engineering design process solves problems.	• Collect, tally, and analyze data regarding personal preferences for learning • Collect, tally, and analyze data regarding Multiple Intelligences Survey selections • Collaborate with peers to complete Pipe Cleaner Challenge/Spaghetti Towers as an introduction and/or review to Engineering Design Process. • Complete and discuss Scientific Method Cube vs. EDP activities (which allow students to compare and contrast the two processes). • Understand, explain and communicate: SM answers	**Performance: Authentic Task** Visual representation of understandings (collage of Personality and MI **Performance: Skill Demonstration** Teacher generated rubric assessing ability to problem solve as a group based on very specific constraints **Performance: Skill Demonstration** Accuracy of student build based on timed individual observations **Written: Informative** Close reading activity modeling proper annotations and comprehension questions	See attached literacy infusions resources. Annotating a text.docx

			questions and EDP solves problems. • Brainstorm and Identify Scenarios as best addressed by either SM or EDP • Observe and analyze Lego Build (one observer at a time for a short period; must communicate to the group) as an example of cooperative problem-solving. • Connect Lego Build Blocks (synthetic plastics that are chosen based on specific constraints of piece use, etc.) to objective and standards • Students will review annotation strategies and techniques using an article describing how legos are made. (RW) • Annotate and Summarize lego article (RW)		

			• Review of application of Metacognitive Reading Strategies to support annotations. (RW) • Write a Research-Based Paragraph to prove that legos are made of ABS plastic.(RW) • Write a Research-Based Paragraph to explain the science behind the fastest ramp.		

Standards:

NJ: 2016 SLS: English Language Arts
NJ: Grade 8
Reading: Informational Text
Key Ideas and Details
NJSLSA.R1 Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
RI.8.1 Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
NJSLSA.R2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
RI.8.2. Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
Writing
Production and Distribution of Writing
NJSLSA.W4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.8.4. Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
NJSLSA.W5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

W.8.5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
NJ: 2016 SLS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12
NJ: Grades 6-8
Writing
NJSLSA.W2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
NJ: 2016 SLS: Science
NJ: MS Physical Science
MS-PS1 Matter and Its Interactions
Performance Expectations

MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

NJ: MS Engineering Design
MS-ETS1 Engineering Design
Performance Expectations

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
NGSS: Science and Engineering Practices
NGSS: 6-8
Practice 2. Developing and using models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
Evaluate limitations of a model for a proposed object or tool.
Practice 4. Analyzing and interpreting data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.
Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena.
NGSS: Crosscutting Concepts
NGSS: 6-8
Crosscutting Statements
1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.
Macroscopic patterns are related to the nature of microscopic and atomic-level structure.

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.
Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.
5. Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.
Matter is conserved because atoms are conserved in physical and chemical processes.
6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.
Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.

NJ: 2014 SLS: 21st Century Life and Careers
NJ: All Grades
Career Ready Practices
Career Ready Practices
CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason.

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

CRP12. Work productively in teams while using cultural global competence.

Types of Energy *(Week 3, 6 Weeks)*	a) How is energy classified in to categories? b) What is the relationship between potential and kinetic energy?	a) All energy is either potential or kinetic and constantly transforms between the two. b) The total amount of energy in a system remains constant so as potential energy decreases, kinetic energy increases and vice versa.	• Collaboratively design (and execute) a procedure to investigate and identify potential and kinetic energy and how amounts change with regard to each other. • Students will graph the objects PE vs KE at various points along the track.	**Other: Teacher Rubric** Teacher constructed rubric based on graphical representations of PE versus KE at physical locations on stretch of track. Teacher created rubric quantifying: problem solving, creativity, craftsmanship and neatness and workplace readiness i.e. Engineering Design Rubric **Written: Journal/Diary**	See attached literacy infusions resources. Zipline Research-Based Paragraphs.docx

			• Utilize engineering design process to construct a Zip-line able to deliver a marble to a specific destination (constraint). • Experiment with various starting heights and marble weights to determine how each variable affects the total amount of PE in the system. • Investigate the transformation of potential energy to some form(s) of kinetic energy utilized by various desk toys. • Read and annotate about potential and kinetic energy in the textbook and from a PowerPoint presentation. RW • Collaboratively design (and execute) a procedure to investigate and identify potential and kinetic energy and how amounts change	Student self reflections with regard to changes/modifications to Zip-lines **Performance: Authentic Task** Student selection and explanation of the transformation of energy by a selected toy	

			with regard to each other. • Students will graph the objects PE vs KE at various points along the track. • Complete a two-paragraph research-based response to explain how potential and kinetic energy are related to creating a zipline. RW • Using Google Docs, peers can review and conference (RBR) RW • Utilize engineering design process to construct a Zip-line able to deliver a marble to a specific destination (constraint). • Experiment with various starting heights and marble weights to determine how each variable affects the total amount of PE in the system. • Investigate the transformation of potential energy		

			to some form(s) of kinetic energy utilized by various desk toys. • Read and annotate the article, 'Shriek Science; Simple Physics Powers Extreme Roller Coasters." https://www.scientificamerican.com/article/shriek-science-simple-physics-powers-extreme-roller-coasters/		

Standards:

NJ: 2016 SLS: English Language Arts
NJ: Grade 8
Reading: Informational Text
Key Ideas and Details
NJSLSA.R1 Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
RI.8.1 Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
NJSLSA.R2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
RI.8.2. Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
NJSLSA.R9 Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.
R.I.8.9. Analyze and reflect on (e.g. practical knowledge, historical/cultural context, and background knowledge) two or more texts that provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.
Writing
NJSLSA.W2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
W.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.

W.8.2a. Introduce a topic and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia).
W.8.2b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
W.8.2c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
W.8.2d. Use precise language and domain-specific vocabulary to inform about or explain the topic.
W.8.2e. Establish and maintain a formal style/academic style, approach, and form.
W.8.2f. Provide a concluding statement or section that follows from and supports the information or explanation presented.
Production and Distribution of Writing
NJSLSA.W4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.8.4. Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
NJSLSA.W5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
W.8.5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
NJSLSA.W6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.
Research to Build and Present Knowledge
NJSLSA.W7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
W.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.
NJSLSA.W8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
W.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.
NJSLSA.W9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
W.8.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
W.8.9b. Apply grade 8 Reading standards to literary nonfiction (e.g., “Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced”).
Range of Writing
NJSLSA.W10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.
W.8.10. Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline- specific tasks, purposes, and audiences.
NJ: 2016 SLS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12
NJ: Grades 6-8
Writing
NJSLSA.W2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
NJ: 2016 SLS: Science
NJ: MS Physical Science

MS-PS3 Energy
Performance Expectations

MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

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.

NJ: MS Engineering Design
MS-ETS1 Engineering Design
Performance Expectations

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
NGSS: Science and Engineering Practices
NGSS: 6-8
Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.
Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
Practice 2. Developing and using models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
Evaluate limitations of a model for a proposed object or tool.
Practice 3. Planning and carrying out investigations
Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.
Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.
Practice 4. Analyzing and interpreting data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.
Practice 8. Obtaining, evaluating, and communicating information
Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.
Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s).
NGSS: Crosscutting Concepts

NGSS: 6-8 **Crosscutting Statements** **2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.** Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. **5. Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.** Matter is conserved because atoms are conserved in physical and chemical processes. 					
NJ: 2014 SLS: 21st Century Life and Careers **NJ: All Grades** **Career Ready Practices** **Career Ready Practices** CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence. 					
Energy Transformation *(Week 9, 1 Week)*	a) How does energy change the living and nonliving components of ecosystem? b) How do models help us to visualize changes in matter at the molecular level?	a) Energy creates physical (identity remains the same) and chemical changes (rearrangement results in new substances) in matter. b) Models allow us demonstrate how energy changes the arrangement of matter or its phase.	• Apply previous knowledge to determine which items in a system represent the living versus nonliving factors (box with soil, water, sun, producer, consumer) • Complete model simulations using hands-on materials and/or technology (i.e. CarbonTime.bscs) to illustrate how matter is cycled (water,	**Unit Assessment Suggestions** **Formative: Performance: Skill Demonstration** Accuracy of student constructed explanations arguing labels for biotic versus abiotic factors Demonstration/Modeling of Laws of Conservation of Energy and Matter through physical and chemical changes in matter in ecosystems	See attached literacy infusions resources.

			oxygen, carbon dioxide, nitrogen, etc.) • Using the background knowledge gained from articles and PPT, determine the types of energy transformations, using both observations and background knowledge, to determine the types of energy transformations that take place in 14 objects.		

Standards:

NJ: 2016 SLS: English Language Arts
NJ: Grade 8
Reading: Informational Text
NJSLSA.R3 Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
RI.8.3. Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).
Craft and Structure
NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RI.8.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.
Range of Reading and Level of Text Complexity
NJSLSA.R10 Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.
RI.8.10. **By the end of the year read and comprehend literary nonfiction (see Appendix A) at grade level text-complexity (see Appendix A) or above, with scaffolding as needed.
NJ: 2016 SLS: Science
NJ: MS Life Science
MS-LS2 Ecosystems: Interactions, Energy, and Dynamics

Performance Expectations

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

NJ: 2014 SLS: Technology
NJ: Grades 6-8
8.1 Educational Technology
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
NGSS: Science and Engineering Practices
NGSS: 6-8
Practice 2. Developing and using models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
Evaluate limitations of a model for a proposed object or tool.
Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena.
Practice 7. Engaging in argument from evidence
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).
Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts.
NGSS: Crosscutting Concepts
NGSS: 6-8
Crosscutting Statements
4. Systems and System Models – A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.
Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.
5. Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.
Matter is conserved because atoms are conserved in physical and chemical processes.

NJ: 2014 SLS: 21st Century Life and Careers
NJ: All Grades
Career Ready Practices
Career Ready Practices
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity. 					
Waves *(Week 10, 4 Weeks)*	a) What types of energy travel in waves? b) What does the structure of a wave tell us about it energy? c) How do various mediums affect a wave? d) How is information transmitted digitally?	a) Sound and light travel via waves b) The structure of a wave (length, amplitude, frequency) provide information about the amount of energy in the wave c) Waves can be either reflected, absorbed, or transmitted through various materials d) Information is sent and received based on the nature of the information (fiber optics, WiFi and code)	• Investigate the electromagnetic spectrum via graphical representations of specific waves. • Analyze visual representations of wavelengths versus location on the spectrum as well as how amplitude does not affect wavelength but wave "strength". • Create a model of the Ritter Ultraviolet Experiment. • Investigate how sound waves interact with each other and medium (i.e. tuning fork lab). • Construct sound proof ear protectors based on evaluations of building material choices and constraints as part of EDP. • Research how information is	**Unit Assessment Suggestions** **Formative:** **Performance: Skill Demonstration** Teacher created summative assessment Experimental model design rubric and student responses to formative assessment Accuracy of student responses as per teacher created rubric Engineering Design Rubric Teacher constructed rubric for narrative response (work with LA/RW teachers)	See attached literacy infusions resources. The Writing Process.docx

			transmitted based on the nature of the information and how it is best delivered. • Read and annotate the textbook and other relevant articles to gather background information on how waves travel. RW • View PowerPoint and take notes on light and sound waves. RW • Complete a Venn Diagram as a Brainstorming strategy to compare and contrast light vs. sound waves RW • Complete a Template/Outline as a Pre-writing strategy in preparation for the compare/contrast essay on light vs. sound. RW • Peer review/conference via Google Docs after writing the compare/contrast		

			• essay on light vs. sound. RW • Construct a 4 paragraph compare and contrast essay on light vs. sound waves. RW		

Standards:

NJ: 2016 SLS: English Language Arts
NJ: Grade 8
Reading: Informational Text
Key Ideas and Details
NJSLSA.R1 Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
RI.8.1 Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
NJSLSA.R3 Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
RI.8.3. Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).
Writing
Text Types and Purposes
NJSLSA.W1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
W.8.1. Write arguments to support claims with clear reasons and relevant evidence.
W.8.1a. Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
W.8.1b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.
W.8.1c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
W.8.1d. Establish and maintain a formal style/academic style, approach, and form.
W.8.1e. Provide a concluding statement or section that follows from and supports the argument presented.
NJSLSA.W2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
W.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.
W.8.2a. Introduce a topic and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia).
W.8.2b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
W.8.2c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
W.8.2d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

W.8.2e. Establish and maintain a formal style/academic style, approach, and form.
W.8.2f. Provide a concluding statement or section that follows from and supports the information or explanation presented.
Production and Distribution of Writing
NJSLSA.W4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.8.4. Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
NJSLSA.W5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
W.8.5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
NJSLSA.W6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.
NJSLSA.W8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
W.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.
NJSLSA.W9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
W.8.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
NJ: 2016 SLS: Science
NJ: MS Physical Science
MS-PS4 Waves and Their Applications in Technologies for Information Transfer
Performance Expectations

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.

MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

MS-PS4-3. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

NJ: MS Engineering Design
MS-ETS1 Engineering Design
Performance Expectations

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
NJ: 2014 SLS: Technology
NJ: Grades 6-8
8.1 Educational Technology
E: Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.

8.1.8.E.1 Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
NJ: Grades 9-12
8.1 Educational Technology
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem orissue.
8.1.12.A.4 Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
NGSS: Science and Engineering Practices
NGSS: 6-8
Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena.
Construct an explanation using models or representations.
Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples, or events.
Apply scientific reasoning to show why the data or evidence is adequate for the explanation or conclusion.
Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system.
Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.
Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and re-testing.
Practice 7. Engaging in argument from evidence
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).
Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts.
Respectfully provide and receive critiques about one's explanations, procedures, models, and questions by citing relevant evidence and posing and responding to questions that elicit pertinent elaboration and detail.
Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.
Make an oral or written argument that supports or refutes the advertised performance of a device, process, or system based on empirical evidence concerning whether or not the technology meets relevant criteria and constraints.
Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.
NGSS: Crosscutting Concepts
NGSS: 6-8
Crosscutting Statements
1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.
Macroscopic patterns are related to the nature of microscopic and atomic-level structure.
2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.
3. Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.
Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.
Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.
Connections to Engineering, Technology and Applications of Science
Interdependence of Science, Engineering, and Technology
Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems.

NJ: 2014 SLS: 21st Century Life and Careers
NJ: All Grades
Career Ready Practices
Career Ready Practices
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.

Forces and Motion *(Week 14, 6 Weeks)*	a) How can we use forces to predict the motion of objects? b) What factors determine the amount of gravitational pull between objects in the universe? c) How can electric and magnetic forces be exerted on objects that are not in contact with each other?	a) Newton's Laws allow us to understand and therefore predict how objects will move based on specific variables. b) Gravitational forces are directly proportional to the mass of the objects and indirectly proportional to the distance between those objects. c) Electric and magnetic forces produce fields that can be exerted on objects that are not	• Read and annotate text/articles/Google Forms to support the catapult lab. (RW) • Design and implement an experimental procedure that yields data and observations that prove unbalanced forces can be	**Other: Teacher Rubric** Teacher generated weighted checklist that evaluates the quality of design with regard to providing data and observation necessary to determine net forces and the results of varying mass on the motion of objects. **Performance: Authentic Task** Engineering Design Rubric	See attached literacy infusions resources. Newton's Second Law Research Based Paragraph.docx Catapult Research Based Paragraph.docx

		actually in contact with one another.	calculated in order to determine net force. ● Vary the mass and force of objects to provide additional information with regard to Newton's 2nd Law (F= ma). ● Build a design that protects a head from horizontal collisions. ● Test design for success regarding constraints and criteria. ● Determine the information required to decide the best design. ● Analyze sample data associated with multiple designs to determine which is design is most successful. ● Gather and analyze data (from either simulations or digital tools) that displays mass, strength of interaction,	**Performance: Authentic Task** Teacher created data to be interpreted by students in order to argue from evidence which design is best	

			distance from Sun and orbital periods within our solar system. ● Be able to prove the existence of both electric and magnetic fields, given a specific choice of materials. Qualitative evidence will be documented with digital photography. ● Research-Based Paragraph (CER): based on sources and data collection which will be used to explain how Newton's Second Law relates to building a catapult.(RW)		

Standards:

NJ: 2016 SLS: English Language Arts
NJ: Grade 8
Reading: Informational Text
Key Ideas and Details
NJSLSA.R1 Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
RI.8.1 Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
NJSLSA.R3 Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

RI.8.3. Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).

Craft and Structure

NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

RI.8.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.

Writing

Text Types and Purposes

NJSLSA.W1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

W.8.1. Write arguments to support claims with clear reasons and relevant evidence.

W.8.1a. Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

W.8.1b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.

W.8.1c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

W.8.1d. Establish and maintain a formal style/academic style, approach, and form.

W.8.1e. Provide a concluding statement or section that follows from and supports the argument presented.

Production and Distribution of Writing

NJSLSA.W4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

W.8.4. Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

NJSLSA.W6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.

Research to Build and Present Knowledge

NJSLSA.W7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

W.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.

Range of Writing

NJSLSA.W10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

W.8.10. Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline- specific tasks, purposes, and audiences.

NJ: 2016 SLS: Science

NJ: MS Earth & Space Sciences

MS-ESS1 Earth's Place in the Universe

Performance Expectations

MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

NJ: MS Physical Science

MS-PS2 Motion and Stability: Forces and Interactions

Performance Expectations

MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.*

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.

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.

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.

NJ: MS Engineering Design
MS-ETS1 Engineering Design
Performance Expectations

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved..
NJ: 2014 SLS: Technology
NJ: Grades 6-8
8.1 Educational Technology
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

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
F: Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.
NGSS: Science and Engineering Practices
NGSS: 6-8
Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.
Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
Practice 4. Analyzing and interpreting data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.
Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena.
Practice 7. Engaging in argument from evidence
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).
Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts.
NGSS: Crosscutting Concepts
NGSS: 6-8
Crosscutting Statements
2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.
Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.
3. Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.
Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
5. Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.
Matter is conserved because atoms are conserved in physical and chemical processes.
6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.
Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.
7. Stability and Change – For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.
Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales, including the atomic scale.
NGSS: Disciplinary Core Ideas
NGSS: 6-8
PS2: Motion and Stability: Forces and Interactions
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)
ETS1: Engineering Design
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. (MS-ETS1-4) (secondary to MS-PS1-6)

Natural Resources and Human Activities *(Week 20, 9 Weeks)*	a) How do natural resources (i.e. minerals, energy, groundwater) form as result of the Earth's geological processes and cycles? b) How can these natural resources then be transformed into synthetic materials such as medicines, foods and alternative fuels? c) If the Earth's natural resources and ecosystems are altered, what are the resulting effects on the Earth's living populations?	a) Cycles (rock, water, etc.) and Laws of Conservation constantly change and rearrange matter as energy flows through Earth's environments. b) Human interventions change natural resources into synthetic materials that are generally the result of chemical changes. c) Human activities have altered both natural resources and the ecosystems they are found in resulting in a rise in global temperatures in the last century that further change the Earth in unintended ways.	• Investigate and present information with regard to a specific natural resource (water, fossil fuels, wind, solar, geothermal, nuclear); its advantages and disadvantages for the Earth and humans. • Test for the pH, hardness, copper, chlorine, and iron in local tap water samples. • Examine grade appropriate databases on human populations and the rates of consumption of food and natural resources. • Investigate human activities such as fossil fuel consumption and agricultural activity, as well as a natural process such as solar radiation and volcanic activity, increase atmospheric levels of CO_2 and methane.	**Other: Teacher Rubric** Teacher constructed rubric (evaluating student created models of selected cycles) **Performance: Lab Assignment** Students will report results on tap water and construct explanations as to how and why materials may or may not be found in tap water in Parsippany, NJ	See attached literacy infusions resources. RST Graphic Organizer.docx Regulation of Energy.doc Paris Agreement.pdf Renewable vs Non Renewable Energy.docx

			Evidence to examine can include global and national maps of temperatures and types of activity. • Work through the writing process to complete the Research Simulation Task (RST). Topic: Should the government regulate energy consumption? RW		

Standards:

NJ: 2016 SLS: English Language Arts
NJ: Grade 8
Reading: Informational Text
Key Ideas and Details
NJSLSA.R1 Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
RI.8.1 Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
NJSLSA.R6 Assess how point of view or purpose shapes the content and style of a text.
RI.8.6. Determine an author's point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints.
Integration of Knowledge and Ideas
NJSLSA.R7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
RI.8.7. Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea.
NJSLSA.R8 Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
RI.8.8. Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.
NJSLSA.R9 Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

R.I.8.9. Analyze and reflect on (e.g. practical knowledge, historical/cultural context, and background knowledge) two or more texts that provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.

Writing

Text Types and Purposes

NJSLSA.W1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

W.8.1. Write arguments to support claims with clear reasons and relevant evidence.

W.8.1a. Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

W.8.1b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.

W.8.1c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

W.8.1d. Establish and maintain a formal style/academic style, approach, and form.

W.8.1e. Provide a concluding statement or section that follows from and supports the argument presented.

Production and Distribution of Writing

NJSLSA.W4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

W.8.4. Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

NJSLSA.W5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

W.8.5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

NJSLSA.W6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.

NJSLSA.W8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

W.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.

NJSLSA.W9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

W.8.9b. Apply grade 8 Reading standards to literary nonfiction (e.g., “Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced”).

Range of Writing

NJSLSA.W10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

W.8.10. Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline- specific tasks, purposes, and audiences.

NJ: 2016 SLS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

NJ: Grades 6-8

Reading: Science & Technical Subjects

Integration of Knowledge and Ideas

NJSLSA.R7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

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).

Writing

NJSLSA.W2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
NJSLSA.W6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
WHST.6-8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
NJSLSA.W8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
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.
NJ: 2016 SLS: Science
NJ: MS Earth & Space Sciences
MS-ESS2 Earth's Systems
Performance Expectations

MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

MS-ESS3 Earth and Human Activity
Performance Expectations

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capital consumption of natural resources impact Earth's systems.

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

NJ: 2014 SLS: Technology
NJ: Grades 6-8
8.1 Educational Technology
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

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
F: Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.
8.2 Technology Education, Engineering, Design, and Computational Thinking
B. Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.

8.2.8.B.3 Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts.
8.2.8.B.4 Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings.
NGSS: Science and Engineering Practices
NGSS: 6-8
Practice 4. Analyzing and interpreting data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.
Practice 5. Using mathematics and computational thinking
Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.
Use digital tools (e.g., computers) to analyze very large data sets for patterns and trends.
Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena.
NGSS: Crosscutting Concepts
NGSS: 6-8
Crosscutting Statements
1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.
Macroscopic patterns are related to the nature of microscopic and atomic-level structure.
2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.
Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.
4. Systems and System Models – A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.
Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.

NJ: 2014 SLS: 21st Century Life and Careers
NJ: All Grades
Career Ready Practices
Career Ready Practices
CRP2. Apply appropriate academic and technical skills.

CRP12. Work productively in teams while using cultural global competence.

Heat Energy as an Example of Kinetic Energy *(Week 29, 4 Weeks)*	a) What happens to particle motion, temperature, and state of matter when thermal energy is added or removed from a pure substance (not a mixture)?	a) When heat energy is added or removed from a substance, particles move differently (faster and further or slower and closer) but temperature remains the same during a change of state or phase.	• Generate data for typical phase change graphs (either experimentally or through a simulation. • Analyze phase change graph to identify the changes observed with specific segments of the graph regarding motion, state and temperature. • Design, create and test a solar oven, thermal house or insulated box. • Read and annotate text/articles/Google Forms/ View relevant videos and take notes heat transfer. (RW) • Research-Based Paragraph on engineering a new spacesuit followed up by a CER conclusion where students	**Formative:** **Performance:** **Authentic Task** Teacher generated formative assessments regarding both appropriate vocabulary and graphing concepts **Written: Informative** Engineering Design Rubric	See attached literacy infusions resources. HeatTransfer Spacesuit Research Based Paragraph.docx

			will analyze the results of their spacesuit invention. (RW)		

Standards:

NJ: 2016 SLS: English Language Arts
NJ: Grade 8
Reading: Informational Text
Key Ideas and Details
NJSLSA.R1 Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
RI.8.1 Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
NJSLSA.R3 Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
RI.8.3. Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).
Craft and Structure
NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RI.8.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.
Writing
Text Types and Purposes
NJSLSA.W1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
W.8.1. Write arguments to support claims with clear reasons and relevant evidence.
W.8.1a. Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
W.8.1b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.
W.8.1c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
W.8.1d. Establish and maintain a formal style/academic style, approach, and form.
W.8.1e. Provide a concluding statement or section that follows from and supports the argument presented.
Production and Distribution of Writing
NJSLSA.W4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.8.4. Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
NJSLSA.W6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.

Research to Build and Present Knowledge
NJSLSA.W7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
W.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.
Range of Writing
NJSLSA.W10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.
W.8.10. Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline- specific tasks, purposes, and audiences.
NJ: 2016 SLS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12
NJ: Grades 6-8
Writing
NJSLSA.W2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
WHST.6-8.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
NJ: 2016 SLS: Science
NJ: MS Physical Science
MS-PS1 Matter and Its Interactions
Performance Expectations

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

MS-PS3 Energy
Performance Expectations

MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.*

NGSS: Science and Engineering Practices
NGSS: 6-8
Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.
Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
Practice 2. Developing and using models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
Evaluate limitations of a model for a proposed object or tool.
Practice 3. Planning and carrying out investigations
Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.

Practice 4. Analyzing and interpreting data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena.

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.

5. Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.

Matter is conserved because atoms are conserved in physical and chemical processes.

6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.

Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.

7. Stability and Change – For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales, including the atomic scale.

NJ: 2014 SLS: 21st Century Life and Careers

NJ: All Grades

Career Ready Practices

Career Ready Practices

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason.

CRP6. Demonstrate creativity and innovation.

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

Chemical Changes in Matter *(Week 32, 6 Weeks)*	a) What physical and chemical properties can describe matter? b) What observations/data/properties identify a chemical change in matter? c) How can models help us to recognize a chemical change at the atomic level and prove the Law of Conservation of Mass?	a) Physical properties: density, melting/boiling points, and solubility. Chemical properties: flammability, and reactivity with acid/base/oxygen/water. b) The observation, analysis and interpretation of changes in properties of a substance before and after a change has taken place can identify a chemical reaction. c) By modeling molecules and regrouping them to represent before and after a chemical change, we can evaluate that the quantity of atoms remains the same. The Law of Conservation of Mass can also be proven within a closed system.	• Compare and contrast various physical and chemical properties of pure substances to become familiar with identification by characteristic properties. • Utilize qualitative properties to determine if chemical changes have taken place and/or identify the components in a mixture. • Demonstrate and quantify that the total number of each type of atom is conserved, as a result, mass does not change. • Read and annotate articles/text on the difference between physical and chemical properties. (RW) • Write a CER conclusion for Cupid's powder lab. Students will use evidence from the lab to	**Other: Teacher Rubric** Teacher constructed rubric evaluating student identification of materials based on characteristic physical and chemical properties. Teacher constructed rubric (evaluating student created models of molecular structures)	See attached literacy infusions resources.

			support their claim of the identity of the unknown substance. (RW) • Write a CER conclusion to prove the Law of Conservation of Mass. (Copper Sulfate lab) (RW)		

Standards:

NJ: 2016 SLS: English Language Arts
NJ: Grade 8
Reading: Informational Text
Key Ideas and Details
NJSLSA.R1 Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
RI.8.1 Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
NJSLSA.R3 Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
RI.8.3. Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).
Craft and Structure
NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RI.8.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.
Writing
Text Types and Purposes
NJSLSA.W1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
W.8.1. Write arguments to support claims with clear reasons and relevant evidence.
W.8.1a. Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
W.8.1b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.
W.8.1c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
W.8.1d. Establish and maintain a formal style/academic style, approach, and form.
W.8.1e. Provide a concluding statement or section that follows from and supports the argument presented.

NJSLSA.W2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
W.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.
W.8.2a. Introduce a topic and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia).
W.8.2b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
W.8.2c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
W.8.2d. Use precise language and domain-specific vocabulary to inform about or explain the topic.
W.8.2e. Establish and maintain a formal style/academic style, approach, and form.
W.8.2f. Provide a concluding statement or section that follows from and supports the information or explanation presented.
Production and Distribution of Writing
NJSLSA.W4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
W.8.4. Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
NJSLSA.W6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
W.8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.
Research to Build and Present Knowledge
NJSLSA.W7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
W.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.
Range of Writing
NJSLSA.W10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.
W.8.10. Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline- specific tasks, purposes, and audiences.
NJ: 2016 SLS: Science
NJ: MS Physical Science
MS-PS1 Matter and Its Interactions
Performance Expectations

MS-PS1-1.Develop models to describe the atomic composition of simple molecules and extended structures.

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

NGSS: Science and Engineering Practices
NGSS: 6-8
Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.
Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
Practice 4. Analyzing and interpreting data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.
Practice 7. Engaging in argument from evidence
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).
Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts.
NGSS: Crosscutting Concepts
NGSS: 6-8
Crosscutting Statements
1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.
Macroscopic patterns are related to the nature of microscopic and atomic-level structure.
5. Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.
Matter is conserved because atoms are conserved in physical and chemical processes.

NJ: 2014 SLS: 21st Century Life and Careers
NJ: All Grades
Career Ready Practices
Career Ready Practices
CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason.

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

Biochemistry *(Week 38, 2 Weeks)*	a) What evidence proves that photosynthesis is the result of a chemical change in plants? b) How can we model chemical reactions to illustrate the rearrangement of atoms	a) By tracing the movement of matter and energy through photosynthesis, the rearrangement of atoms and molecules and the release of energy can by identified.	• Utilize understanding of chemical change to compare and contrast the reactants versus products in the chemical	**Formative: Other: Teacher Rubric** Teacher generated formative assessments regarding both appropriate vocabulary and graphing concepts	See attached literacy infusions resources.

	and molecules in addition to the release of energy? c) How can biochemistry explain adaptations and mutations in living organisms?	b) If molecules like water and carbon dioxide can be represented visually or physically, we can then demonstrate their rearrangement into new and different substances. This rearrangement both requires and releases energy. c) If molecules are accidentally rearranged at the chromosomal level, the resulting changes in proteins can then by identified as either mutations or adaptations at the cellular or organism level.	equation for photosynthesis through a simulation activity. ● Trace the series of chemical reactions that food goes through as it is broken down and rearranged to form new molecules that support growth or release energy. ● Analyze the connection between various changes in chromosomal structures and the presenting changes in organisms. ● Photosynthesis 3-D Leaf Model lab ● GIZMO Photosynthesis Lab: Growing Plants ● Students will write a CER paragraph answering the question "Which factor has the greatest effect on plant growth?" RW	Teacher constructed rubric (evaluating student created models of molecular structures) **Performance: Authentic Task** Teacher generated weighted checklist evaluating student connections	

Standards:

NJ: 2016 SLS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12
NJ: Grades 6-8
Writing
NJSLSA.W8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
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.
NJ: 2016 SLS: Science
NJ: MS Life Science
MS-LS1 From Molecules to Organisms: Structures and Processes
Performance Expectations

MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

MS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

MS-LS3 Heredity: Inheritance and Variation of Traits
Performance Expectations

MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

NJ: 2014 SLS: Technology
NJ: Grades 6-8
8.1 Educational Technology
8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
NGSS: Science and Engineering Practices
NGSS: 6-8
Practice 2. Developing and using models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
Evaluate limitations of a model for a proposed object or tool.
Practice 4. Analyzing and interpreting data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.
Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena.
Practice 7. Engaging in argument from evidence
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).
Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts.
NGSS: Crosscutting Concepts
NGSS: 6-8
Crosscutting Statements
2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.
Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.
4. Systems and System Models – A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.
Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.
5. Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.
Matter is conserved because atoms are conserved in physical and chemical processes.
6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.
Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.
7. Stability and Change – For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.
Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales, including the atomic scale.

NJ: 2014 SLS: 21st Century Life and Careers
NJ: All Grades
Career Ready Practices
Career Ready Practices
CRP7. Employ valid and reliable research strategies.

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

Appendix A Sample Authentic Assessment

(Week 1, 1 Week)

Sample Authentic Assessment

Performance: Authentic Task

You are a young chemist who is experienced in analyzing the components of mixtures. A local consumer finds an old, unmarked substance that she thinks might be an effective stain removing agent but is reluctant to use it until she is sure. Therefore, she has brought the substance to you for your analysis.

TASK

You will need to:

- utilize what you know about physical properties of matter to design a series of experiments that will separate the mixture into its components.
- perform the experimental tests to separate the mixture
- identify the components of the mixture based on the physical properties of each
- write a detailed analysis statement that will be given to the consumer explaining and justifying your results.

Appendix B Sample Assessment Rubric

(Week 1, 1 Week)

Appendix B Sample Assessment Rubric

Other: Teacher Rubric

SAMPLE AUTHENTIC ASSESSMENT RUBRIC – Grade 8.docx

Appendix C Self Assess Log & Self Reflection Sheet

(Week 1, 1 Week)

Self Assessment Log & Self Reflection Sheet

Written: Journal/Diary

Self Assessment Log & Sheet.docx

Appendix D Selected Activities

(Week 1, 1 Week)

Selected Activities

Performance: Lab Assignment

Selected Activities.docx

Appendix E Teacher Resources

(Week 1, 1 Week)
Teacher Resources
Performance: Skill Demonstration
How are LEGO® Pieces Made.docx

Literacy Infusion Resources
(Week 1, 1 Week)
Catapult Research Based Paragraph.docx
HeatTransfer Spacesuit Research Based Paragraph.docx
Newton's Second Law Research Based Paragraph.docx
Paris Agreement.pdf
Regulation of Energy.doc
Renewable vs Non Renewable Energy.docx
SCN883 Science Grade 8.pdf
The Writing Process.docx
Zipline Research-Based Paragraphs.docx
The Great Pumpkin Toss.docx
zipline rubric (1).docx

BIBLIOGRAPHY

SOURCES: TEXTBOOKS
Buckley, Don, et. al. *Introduction to Chemistry: Interactive Science*. Upper Saddle River, NJ. Pearson Education, Inc., 2011.
Buckley, Don, et. al. *Forces and Energy: Interactive Science*. Upper Saddle River, NJ. Pearson Education, Inc., 2011.
Buckley, Don, et. al. *Sound and Light: Interactive Science*. Upper Saddle River, NJ. Pearson Education, Inc., 2011.

SUPPLEMENTAL TEXTBOOK MATERIALS
Teacher Resources for Forces and Energy: Interactive Science. Upper Saddle River, NJ. Pearson Education, Inc., 2011
Teacher Resources for Sound and Light: Interactive Science. Upper Saddle River, NJ. Pearson Education, Inc., 2011
Frank, David, et. al. *Science Explorer: Physical Science*. Upper Saddle River, NJ. Pearson Education, Inc., 2009.
Tap Water Tour. Chestertown, MD. LaMotte Company
Teacher Resources for Introduction to Chemistry: Interactive Science. Upper Saddle River, NJ. Pearson Education, Inc., 2011

WEBSITES:
The Great Energy Debate – Project NEED

http://www.pbslearningmedia.org
coolcosmos.ipac.caltech.edu/cosmic classroom
www.chem4kids.org
www.physics4kids.org
www.kentchemistry.com
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http://www.engineeringinteract.org/resources/parkworldplot/flash/concepts/friction.htm
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