Grade 8
Module I Dimensions
Energy and Energy Transfer

New Jersey Student Learning Standards

Established	2016-2017
Revised	2017-2018
Revised	2018-2019
Revised	2019-2020
Revised	2020-2021
Revised	2022-2023

Marking Period	Unit Title	Recommended Instructional Days
3 (and beginning of MP4)	**Energy and Energy transfer**	**35 Days**

NJSLS - Science: *Title*	NJSLS - Science: *Performance Expectations*	Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSLS-S within Unit
MS-PS3: Energy	**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-PS3-3.** Apply scientific principles to design, construct, and test a device that either	**Essential Question/s:** 1. What are the factors that cause objects to move? 2. How can energy be transferred from one system to another? 3. How can energy be transferred from one material to another? 4. What happens to an object when energy is transferred to it? 5. How does energy transfer relate to the law of conservation of energy/matter? 6. How is energy transformed from one form to another? (mechanical, chemical, heat, etc) **Activity Description:** ❖ Lesson Phenomenon: Alternative energy ❖ Unit Opener: Can you Explain it? ❖ Hands on Lab: Investigate Energy in a Rollback Can ❖ Hands on Lab: Analyze energy in systems ❖ Hands on Lab: Design a toy to teach potential energy ❖ Hands on Lab: Optimize a toy to teach potential

	minimizes or maximizes thermal energy transfer.* **MS-PS3-4.** Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. **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. **MS-ETS1-1.** Define the criteria and constraints of a design	energy ❖ Hands on Lab: Investigate the transfer of energy ❖ Hands on Lab: Compare thermal energy in an object ❖ Hands on Lab: Examine the transfer of thermal energy through radiation ❖ Hands on Lab: Design and test an insulated container ❖ "Take it Further" activities ❖ Virtual Lab: Kinetic energy ❖ Virtual Lab: How are temperature and kinetic energy related? ❖ Virtual Lab: Temperature and thermal energy **Lab and engineering activities will incorporate these skills:** ● Planning and Organization ● Critical Thinking ● Communication in a group ● Decision Making ● Reflection on activity and participation **Spotlight on scientists and their accomplishments** Ex. Angela Clayton - Nuclear Physicist Annie Easley - Rocket Scientist

	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. **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	Human Impacts on Earth Demonstrate how thermal energy drives weather patterns and creates conditions for climate change through energy transfers and transformations. (conduction, radiation, convection and Greenhouse Effect) HMH: Book I Unit 2 Lesson 3 - Energy Transfer in Systems **Interdisciplinary Connection: Content: (NJSLS#)** **Connections to Mathematics:** ● Work with ratios and proportional relationships and basic statistics ● Reason abstractly and quantitatively **(MP.2)** ● Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities **(6.RP.A.1)** ● Understand the concept of a unit rate a/b associated with a ratio a:b with $b \neq 0$, and use rate language in the context of a ratio relationship. **(6.RP.A.2)** ● Recognize and represent proportional relationships between quantities. **(7.RP.A.2)** ● Know and apply the properties of integer exponents to generate equivalent numerical expressions. **(8.EE.A.1)**

	generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	• Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. **(8.EE.A.2)** • Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. **(8.F.A.3)** • Summarize numerical data sets in relation to their context. **(6.SP.B.5)** **<u>Connections to Language Arts:</u>** • Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. **(SL.8.5)** • Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **(RST.6-8.1)** • Integrate information expressed in words with a version expressed visually (e.g., in a flowchart, diagram, model, graph, or table) **(RST6-8.7)** • Write arguments focused on discipline content **(WHST.6-8.1)**
FOUNDATION Disciplinary: *Core Idea*	**FOUNDATION Disciplinary: *Statement***	
PS3.A Definitions of energy	Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.(MS-PS3-1) A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2) Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter	

PS3.B Conservation of Energy and Energy Transfer **PS3.C Relationship Between Energy and Forces** **ETS1.A Defining and delimiting an Engineering Problem**	present. (MS-PS3-3),(MS-PS3-4) When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5) The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4) Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3) When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2) The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be	• Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **(RST.6-8.3)** • 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. **(WHST.6-8.7)**

ETS1.B Developing Possible Solutions	successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (secondary to MS-PS3-3) A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (secondary to MS-PS3-3)	
FOUNDATION **Science and Engineering Practices:** ***Core Idea***	**FOUNDATION** **Science and Engineering Practices:** ***Statement***	
Planning and Carrying Out Investigations	Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations	

Developing and Using Models	or design solutions. Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena design systems.	
Analyzing and Interpreting Data	Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.	
Constructing Explanations and Designing Solutions	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.	

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 worlds.	
FOUNDATION Crosscutting Concepts: ***Core Idea***	**FOUNDATION Crosscutting Concepts:** ***Statement***	
Scale, Proportion, and Quantity	Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. (MS-PS3-1), (MS-PS3-4)	
Systems and System Models	Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems. (MS-PS3-2)	

Energy and Matter ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence**	Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). (MS-PS3-5) The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS3-3) Science knowledge is based upon logical and conceptual connections between evidence and explanations (MS-PS3-4), (MS-PS3-5)	
Social and Emotional Learning: ***Competencies***	**Social and Emotional Learning:** ***Sub-Competencies***	
Responsible Decision-Making Relationship Skills	● Develop, implement, and model effective problem-solving and critical thinking skills ● Utilize positive communication and social skills to interact effectively with others	

Self-Management Social Awareness Social Awareness	• Recognize the skills needed to establish and and achieve personal and educational goals • Demonstrate an understanding of the need for mutual respect when viewpoints differ. • Demonstrate an awareness of the expectations for social interactions in a variety of ways. • Recognize the importance of self-confidence in handling daily tasks and challenges	
Assessments (Formative) ***To show evidence of meeting the standard/s, students will successfully engage within:***		**Assessments (Summative)** ***To show evidence of meeting the standard/s, students will successfully complete:***
Formative Assessments: • Diagnostic tests used to modify teaching and learning activities to improve student attainment		**Benchmarks:** • District Assessment **Summative Assessments:** • End of unit/chapter tests/lesson quizzes

Differentiated Student Access to Content: **Teaching and Learning *Resources/Materials***			
Core	**Alternate**	**ELL**	**Gifted & Talented**

Resources	Core Resources *IEP/504/At-Risk/ESL*	Core Resources	Core Resources
• **Interactive Worktext** • **Equipment Kits** • **Online Simulations** • **IXL Science** • **Evidence Notebook** • **BrainPop Science** • **Lab Safety Handbook** • **CK 12**	• Multilingual Glossary • Sciencesaurus • Online Science Tools (Scientific Calculator, Graphing) • BrainPopEspanol	• Multilingual Glossary • Sciencesaurus • Online Science Tools (Scientific Calculator, Graphing) • Brain Pop ELL	• Online Simulations • CK 12 • Virtual Labs • Webquests • PHET • Video-Based Projects • Take It Further • You Solve It ! • Unit Performance Tasks • Unit Projects • Online Science Tools (Scientific Calculator, Graphing) • BrainPop Science • IXL Science

Supplemental Resources

Technology: 8.1.8.A.1, 8.1.8.A. 2, 8.1.8.A.3, 8.1.8.A. 4, 8.1.8.A. 5

Other: Career Education

- CRP4 Communicate clearly and effectively and with reason.
- CRP6 Demonstrate creativity and innovation

- CRP7 Employ valid and reliable research strategies
- CRP11 Use technology to enhance productivity

Differentiated Student Access to Content:
Recommended Strategies & Techniques

Core Resources	**Alternate Core Resources** ***IEP/504/At-Risk/ESL***	**ELL Core Resources**	**Gifted & Talented Core Resources**
• **Large group instruction** • **Small group instruction** • **Think Pair Share** • **Peer editing** • **Cooperative group work** • **Multimedia presentations** • **Choice Boards/Learning Menus** • **Manipulatives**	• Utilize a multi-sensory (VAKT) approach during instruction, provide alternate presentations of skills by varying the method (repetition, simple explanations, additional examples, modeling, etc.), modify test content and/or format, allow students to retake test for additional credit, provide additional times and preferential seating as needed, review, restate and repeat directions, provide study guides, and/or break assignments into segments of shorter tasks.	• Extend time requirements, preferred seating, positive reinforcement, check often for understanding/review, oral/visual directions/prompts when necessary, supplemental materials including use of an online bilingual dictionary, and modified assessment and/or rubric.	• Create an enhanced set of introductory activities, integrate active teaching/learning opportunities, incorporate authentic components, propose interest-based extension activities, and connect student to related talent development opportunities.

NJSLS CAREER READINESS, LIFE LITERACIES & KEY SKILLS	**Disciplinary Concept: 1.Career Awareness and Planning, 2.Creativity and Innovation, 3.Critical Thinking and Problem Solving, 4.Global and Cultural Awareness 5. Digital Citizenship 6. Information and Media Literacy 7. Technology Literacy**	
	Core Ideas:	**1. There are a variety of resources available to help navigate the career planning process.** **2. Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.** **3. Multiple solutions often exist to solve a problem.** **4. Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction.** **5. Detailed examples exist to illustrate crediting others when incorporating their digital artifacts in one's own work.** **6. Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated.** **7. Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others**
	Performance Expectation/s:	**1. 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.** **2. 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5,**

		7.1.NH.IPERS.6, 8.2.8.ETW.4). **3. 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).** **4. 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.** **5. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use.** **5. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8).** **6. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.** **7. 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).** **7. 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).**
	Career Readiness, Life Literacies, & Key Skills Practices	
	• Act as a responsible and contributing community member and employee. • Demonstrate creativity and innovation. • Utilize critical thinking to make sense of problems and persevere in solving them. • Consider the environmental, social and economic impacts of decisions. • Use technology to enhance productivity, increase collaboration and communicate effectively. • Work productively in teams while using cultural/global competence.	

New Jersey Legislative Statutes and Administrative Code (place an "X" before each law/statute if/when present within the curriculum map)									
X	Amistad Law: *N.J.S.A. 18A 52:16A-88*		Holocaust Law: *N.J.S.A. 18A:35-28*	X	LGBT and Disabilities Law: *N.J.S.A. 18A:35-4.35*	X	Diversity & Inclusion: *N.J.S.A. 18A:35-4.36a*	X	Standards in Action: *Climate Change*