Grade 6, 7, 8				
EARTH AND SPACE SCIENCES				
MS-ESS1		**Earth's Place in the Universe**		
Learning Standard	**Science and Engineering Practices**	**Disciplinary Core Ideas**	**Resources**	**Assessments**
MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system. MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.	**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. ● Develop and use a model to describe phenomena. (MS-ESS1-1),(MS-ESS1-2) **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. ● Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3) **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.	**ESS1.A: The Universe and Its Stars** ● Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) ● Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) **ESS1.B: Earth and the Solar System** ● The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2), (MSESS1-3) ● This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1) ● The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2) **ESS1.C: The History of Planet Earth**	https://www.state.nj.us/education/modelcurriculum/sci/videos/ https://www.state.nj.us/education/aps/cccs/science/resources/QR68.pdf http://nstahosted.org/pdfs/ngss/resources/MatrixForK-12ProgressionOfScienceAndEngineeringPracticesInNGSS.8.14.14.pdf	Ask questions Define problems Develop and use models Plan and carry out investigations Analyze and interpret data Formative assessment Teacher observation Class discussion Venn diagram New Jersey Student Learning Assessment – Grade 8: Science (NJSLA-S) https://nces.ed.gov/surveys/pisa/educators.asp https://ngss-assessment.portal.concord.org/ngsa-collections https://www.nationsreportcard.gov/science_2009/ict_tasks.asp

	• 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. (MS-ESS1- 4)	• The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4)		
Interdisciplinary ELA	**Interdisciplinary Mathematics**	**21st Century and Career Integration**	**Technology Integration**	**Core and Supplemental Instructional Materials**
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-3), (MS-ESS1-4) **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS1-3) **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS1-4) **SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS1-1), (MS-ESS1-2)	**MP.2** Reason abstractly and quantitatively. (MS-ESS1-3) **MP.4** Model with mathematics. (MS-ESS1-1),(MS-ESS1-2) **6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS1-1), (MS-ESS1-2), (MS-ESS1-3)	**Patterns** Patterns can be used to identify causeand-effect relationships. (MS-ESS1-1) **Scale, Proportion, and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3), (MS-ESS1-4) **Systems and System Models** Models can be used to represent systems and their interactions. (MS-ESS1-2)	**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. (MSESS1-3)	Generation Genius Brain Pop

Grades 6, 7, 8

EARTH AND SPACE SCIENCES				
MS-ESS2		**Earth's Systems**		
Learning Standard	**Science and Engineering Practices**	**Disciplinary Core Ideas**	**Resources**	**Assessments**
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-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. 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-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.	**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. • Develop and use a model to describe phenomena. (MSESS2-1),(MS-ESS2-6) • Develop a model to describe unobservable mechanisms. (MS-ESS2-4) **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. • Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-ESS2-5) **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	**ESS1.C: The History of Planet Earth** • Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE) (secondary to MS-ESS2-3) **ESS2.A: Earth's Materials and Systems** • All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1) • The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2) **ESS2.B: Plate Tectonics and Large-Scale System Interactions** • Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3) **ESS2.C: The Roles of Water in Earth's Surface Processes** • Water continually cycles among land, ocean, and atmosphere	https://www.state.nj.us/education/modelcurriculum/sci/videos/ https://www.state.nj.us/education/aps/cccs/science/resources/QR68.pdf http://nstahosted.org/pdfs/ngss/resources/MatrixForK-12ProgressionOfScienceAndEngineeringPracticesInNGSS.8.14.14.pdf	Ask questions Define problems Develop and use models Plan and carry out investigations Analyze and interpret data Formative assessment Teacher observation Class discussion Venn diagram New Jersey Student Learning Assessment – Grade 8: Science (NJSLA-S)

	basic statistical techniques of data and error analysis. ● Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3) **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. ● 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 nature operate today as they did in the past and will continue to do so in the future. (MS-ESS2-2)	via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4) ● The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MSESS2-5) ● Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4) ● Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6) ● Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2) **ESS2.D: Weather and Climate** ● Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6) ● Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5) ● The ocean exerts a major influence on weather and climate by absorbing energy from		

		the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)		
Interdisciplinary ELA	**Interdisciplinary Mathematics**	**21st Century and Career Integration**	**Technology Integration**	**Core and Supplemental Instructional Materials**
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-2) ,(MS-ESS2-3), (MS-ESS2-5) **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS2-3) **RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-3), (MS-ESS2-5) **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS2-2) **WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS2-5) **SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add	**MP.2** Reason abstractly and quantitatively. (MS-ESS2-2), (MS-ESS2-3), (MS-ESS2-5) **6.NS.C.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-ESS2-5) **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS2-2), (MS-ESS2-3) **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS2-2), (MS-ESS2-3)	**Patterns** Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3) **Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MSESS2-5) **Scale Proportion and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS2- 2) **Systems and System Models** Models can be used to represent systems and their interactions—such as inputs, processes and outputs— and energy, matter, and information flows within systems. (MS-ESS2-6) **Energy and Matter** Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4) **Stability and Change** Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)		Generation Genius Brain Pop

interest. (MS-ESS2-1), (MS-ESS2-2), (MSESS2-6)				

Grade 5				
EARTH AND SPACE SCIENCES				
MS-ESS3		**Earth and Human Activity**		
Learning Standard	**Science and Engineering Practices**	**Disciplinary Core Ideas**	**Resources**	**Assessments**
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-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita 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.	**Asking Questions and Defining Problems** Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models. ● Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5) **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. ● Analyze and interpret data to determine similarities and differences in findings. (MSESS3-2) **Constructing Explanations and Designing Solutions**	**ESS3.A: Natural Resources** ● Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1) **ESS3.B: Natural Hazards** ● Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MSESS3-2) **ESS3.C: Human Impacts on Earth Systems** ● Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive)	https://www.state.nj.us/education/modelcurriculum/sci/videos/ https://www.state.nj.us/education/aps/cccs/science/resources/QR68.pdf http://nstahosted.org/pdfs/ngss/resources/MatrixForK-12ProgressionOfScienceAndEngineeringPracticesInNGSS.8.14.14.pdf	Ask questions Define problems Develop and use models Plan and carry out investigations Analyze and interpret data Formative assessment Teacher observation Class discussion Venn diagram New Jersey Student Learning Assessment – Grade 8: Science (NJSLA-S)

	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 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. (MSESS3-1)	for different living things. (MS-ESS3-3) ● Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS-ESS3-3),(MS-ESS3- 4) **ESS3.D: Global Climate Change** ● Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)		
Interdisciplinary ELA	**Interdisciplinary Mathematics**	**21st Century and Career Integration**	**Technology Integration**	**Core and Supplemental Instructional Materials**

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1), (MS-ESS3-2),(MS-ESS3-4), (MS-ESS3-5) **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS3-2) **WHST.6-8.1** Write arguments focused on discipline content. (MS-ESS3-4) **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS3-1) **WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ESS3-3) **WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS3-3) **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1), (MS-ESS3-4)	**MP.2** Reason abstractly and quantitatively. (MS-ESS3-2), (MS-ESS3-5) **6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS3-3), (MS-ESS3- 4) **7.RP.A.2** Recognize and represent proportional relationships between quantities. (MS-ESS3-3), (MS-ESS3-4) **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS3-1), (MS-ESS3-2), (MSESS3-3), (MS-ESS3-4), (MS-ESS3-5) **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-3), (MS-ESS3-4), (MS-ESS3-5)	**Patterns** ● Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2) **Cause and Effect** ● Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3) ● Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1), (MS-ESS3-4) **Stability and Change** ● Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)	**Influence of Science, Engineering, and Technology on Society and the Natural World** ● All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3- 1),(MS-ESS3-4) ● The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-2), (MS-ESS3-3)	Generation Genius Brain Pop

Grade 6, 7, 8				
EARTH AND SPACE SCIENCES				
MS-ETS1		**Engineering Design**		
Learning Standard	**Science and Engineering Practices**	**Disciplinary Core Ideas**	**Resources**	**Assessments**
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. 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.	**Asking Questions and Defining Problems** Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models. ● Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1) **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. ● Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4) **Analyzing and Interpreting Data**	**ETS1.A: Defining and Delimiting Engineering Problems** ● The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1) **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) ● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3) ● Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) ● Models of all kinds are important for testing solutions. (MS-ETS1-4) **ETS1.C: Optimizing the Design Solution** ● Although one design may not perform the best across all tests,	https://www.state.nj.us/education/modelcurriculum/sci/videos/ https://www.state.nj.us/education/aps/cccs/science/resources/QR68.pdf http://nstahosted.org/pdfs/ngss/resources/MatrixForK-12ProgressionOfScienceAndEngineeringPracticesInNGSS.8.14.14.pdf	Ask questions Define problems Develop and use models Plan and carry out investigations Analyze and interpret data Formative assessment Teacher observation Class discussion Venn diagram New Jersey Student Learning Assessment – Grade 8: Science (NJSLA-S)

	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. ● Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3) **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. ● Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)	identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3) ● The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MSETS1-4)		
Interdisciplinary ELA	**Interdisciplinary Mathematics**	**21st Century and Career Integration**	**Technology Integration**	**Core and Supplemental Instructional Materials**
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1), (MS-ETS1-2), (MS-ETS1-3) **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ETS1-3) **RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that	**MP.2** Reason abstractly and quantitatively. (MS-ETS1-1), (MS-ETS1-2), (MS-ETS1-3), (MS-ETS1-4) **7.EE.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental		**Influence of Science, Engineering, and Technology on Society and the Natural World** ● All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1) ● The uses of technologies and	Generation Genius Brain Pop

gained from reading a text on the same topic. (MS-ETS1-2), (MS-ETS1-3) **WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ETS1-2) **WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ETS1-1) . **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2) **SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ETS1-4)	computation and estimation strategies. (MS-ETS1-1), (MS-ETS1-2), (MS-ETS1-3) **7.SP** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. (MS-ETS1-4)		limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)	

Grades 6, 7, 8				
Life Sciences				
MS-LS1		**From Molecules to Organisms: Structures and Processes**		
Learning Standard	**Science and Engineering Practices**	**Disciplinary Core Ideas**	**Resources**	**Assessments**
MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. MS-LS1-3. Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. MS-LS1-4. Use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. 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	**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. • Develop and use a model to describe phenomena. (MS-LS1-2) • Develop a model to describe unobservable mechanisms. (MS-LS1-7) **Planning and Carrying Out Investigations** Planning and carrying out investigations in 6-8 builds on K5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions. • Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1) **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	**LS1.A: Structure and Function** • All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1) • Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2) • In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3) **LS1.B: Growth and Development of Organisms** • Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4) Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4) • Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5) **LS1.C: Organization for Matter and Energy Flow in Organisms**	https://www.state.nj.us/education/modelcurriculum/sci/videos/ https://www.state.nj.us/education/aps/cccs/science/resources/QR68.pdf http://nstahosted.org/pdfs/ngss/resources/MatrixForK-12ProgressionOfScienceAndEngineeringPracticesInNGSS.8.14.14.pdf	Ask questions Define problems Develop and use models Plan and carry out investigations Analyze and interpret data Formative assessment Teacher observation Class discussion Venn diagram New Jersey Student Learning Assessment – Grade 8: Science (NJSLA-S)

support growth and/or release energy as this matter moves through an organism. MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	multiple sources of evidence consistent with scientific knowledge, principles, and theories. ● 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. (MS-LS1-5), (MS-LS1-6) **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). ● Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3) ● Use 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. (MS-LS1-4)	● Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1- 6) ● Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7) **LS1.D: Information Processing** ● Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1- 8) **PS3.D: Energy in Chemical Processes and Everyday Life** ● The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6) ● Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with		

	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. ● Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS1-8)	oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)		
Interdisciplinary ELA	**Interdisciplinary Mathematics**	**21st Century and Career Integration**	**Technology Integration**	**Core and Supplemental Instructional Materials**
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-3), (MS-LS1-4), (MS-LS1-5), (MS-LS1-6) **RST.6-8.2** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-5), (MS-LS1-6) **RI.6.8** Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MSLS1-3), (MS-LS1-4) **WHST.6-8.1** Write arguments focused on discipline content. (MS-LS1-3), (MS-LS1-4) **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information	**6.EE.C.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1), (MS-LS1-2), (MS-LS1-3), (MS-LS1-6) **6.SP.A.2** Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MSLS1-4), (MS-LS1-5) **6.SP.B.4** Summarize numerical data sets in relation to their	**Cause and Effect** ● Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8) ● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4), (MSLS1-5) **Scale, Proportion, and Quantity** ● Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1) **Systems and System Models** ● Systems may interact with other systems; they	**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. (MS-LS1- 1)	Generation Genius Brain Pop

through the selection, organization, and analysis of relevant content. (MS-LS1-5), (MS-LS1-6) **WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-LS1-1) **WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-LS1-8) **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5), (MS-LS1-6) **SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2), (MS-LS1-7)	context. (MS-LS1-4), (MS-LS1-5)	may have sub-systems and be a part of larger complex systems. (MS-LS1-3) **Energy and Matter** ● Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7) ● Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1- 6) **Structure and Function** ● Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2)		

Grades 6, 7, 8				
Life Sciences				
MS-LS2		**Ecosystems: Interactions, Energy, and Dynamics**		
Learning Standard	**Science and Engineering Practices**	**Disciplinary Core Ideas**	**Resources**	**Assessments**

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*	**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. ● Develop a model to describe phenomena. (MS-LS2-3) **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. ● Analyze and interpret data to provide evidence for phenomena. (MS-LS2-1) **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. ● Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2) **Engaging in Argument from Evidence**	**LS2.A: Interdependent Relationships in Ecosystems** ● Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1) ● In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1) ● Growth of organisms and population increases are limited by access to resources. (MS-LS2-1) ● Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2) **LS2.B: Cycle of Matter and Energy Transfer in Ecosystems** ● Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact	https://www.state.nj.us/education/modelcurriculum/sci/videos/ https://www.state.nj.us/education/aps/cccs/science/resources/QR68.pdf http://nstahosted.org/pdfs/ngss/resources/MatrixForK-12ProgressionOfScienceAndEngineeringPracticesInNGSS.8.14.14.pdf	Ask questions Define problems Develop and use models Plan and carry out investigations Analyze and interpret data Formative assessment Teacher observation Class discussion Venn diagram New Jersey Student Learning Assessment – Grade 8: Science (NJSLA-S)

	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). ● Construct 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. (MS-LS2-4) ● Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2- 5)	within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3) **LS2.C: Ecosystem Dynamics, Functioning, and Resilience** ● Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4) ● Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS-LS2-5) **LS4.D: Biodiversity and Humans** ● Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5) **ETS1.B: Developing Possible Solutions** ● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.		

		(secondary to MS-LS2-5)		
Interdisciplinary ELA	**Interdisciplinary Mathematics**	**21st Century and Career Integration**	**Technology Integration**	**Core and Supplemental Instructional Materials**
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-1), (MS-LS2-2), (MS-LS2-4) **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS2-1) **RST.6-8.8** Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5) **RI.8.8** Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS-4), (MS-LS2-5) **WHST.6-8.1** Write arguments to support claims with clear reasons and relevant evidence. (MS-LS2-4) **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS2-2) **WHST.6-8.9** Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-2), (MS-LS2-4)	**MP.4** Model with mathematics. (MS-LS2-5) **6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-LS2-5) **6.EE.C.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS2-3) **6.SP.B.5** Summarize numerical data sets in relation to their context. (MS-LS2-2)	**Patterns** Patterns can be used to identify cause and effect relationships. (MS-LS2-2) **Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1) **Energy and Matter** The transfer of energy can be tracked as energy flows through a natural system. (MSLS2-3) **Stability and Change** Small changes in one part of a system might cause large changes in another part. (MSLS2-4), (MS-LS2-5)	**Influence of Science, Engineering, and Technology on Society and the Natural World** The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-LS2-5)	Generation Genius Brain Pop

SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS2-2) **SL.8.4** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS2-2) **SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS2-3)				

Grades 6,7,8				
Life Sciences				
MS-LS3		**Heredity: Inheritance and Variation of Traits**		
Learning Standard	**Science and Engineering Practices**	**Disciplinary Core Ideas**	**Resources**	**Assessments**
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. MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual	**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. ● Develop and use a model to describe phenomena. (MS-LS3-1),(MS-LS3-2)	**LS1.B: Growth and Development of Organisms** ● Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MSLS3-2) **LS3.A: Inheritance of Traits** ● Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific	https://www.state.nj.us/education/modelcurriculum/sci/videos/ https://www.state.nj.us/education/aps/cccs/science/resources/QR68.pdf http://nstahosted.org/pdfs/ngss/resources/MatrixForK-12ProgressionOfScienceAndEngineeringPracticesInNGSS.8.14.14.pdf	Ask questions Define problems Develop and use models Plan and carry out investigations Analyze and interpret data Formative assessment Teacher observation Class discussion Venn diagram New Jersey Student Learning Assessment – Grade 8: Science (NJSLA-S)

reproduction results in offspring with genetic variation.		proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1) ● Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2) **LS3.B: Variation of Traits** ● In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2) ● In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)		
Interdisciplinary ELA	**Interdisciplinary Mathematics**	**21st Century and Career Integration**	**Technology Integration**	**Core and Supplemental Instructional Materials**

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS3-1), (MS-LS3-2) **RST.6-8.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. (MS-LS3-1), (MS-LS3-2) **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS3-1), (MS-LS3-2) **SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS3-1), (MS-LS3-2)	**MP.4** Model with mathematics. (MS-LS3-2) **6.SP.B.5** Summarize numerical data sets in relation to their context. (MS-LS3-2)	**Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3- 2) **Structure and Function** 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 structures/systems can be analyzed to determine how they function. (MS-LS3-1)		Generation Genius Brain Pop

Grades 6, 7, 8				
Life Sciences				
MS-LS4		**Biological Evolution: Unity and Diversity**		
Learning Standard	**Science and Engineering Practices**	**Disciplinary Core Ideas**	**Resources**	**Assessments**
MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that	**Analyzing and Interpreting Data** Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between	**LS4.A: Evidence of Common Ancestry and Diversity** ● The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or	https://www.state.nj.us/education/modelcurriculum/sci/videos/ https://www.state.nj.us/education/aps/cccs/science/resources/QR68.pdf	Ask questions Define problems Develop and use models Plan and carry out investigations Analyze and interpret data Formative assessment Teacher observation

natural laws operate today as in the past. MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. MS-LS4-3. Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. [MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	correlation and causation, and basic statistical techniques of data and error analysis. ● Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3) ● Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1) **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 mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6) **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. ● Apply scientific ideas to construct an explanation for realworld phenomena, examples, or events. (MS-LS4-2) ● Construct an explanation that	through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1) ● Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2) ● Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3) **LS4.B: Natural Selection** ● Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4) ● In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5) **LS4.C: Adaptation** ● Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and	http://nstahosted.org/pdfs/ngss/resources/MatrixForK-12ProgressionOfScienceAndEngineeringPracticesInNGSS.8.14.14.pdf	Class discussion Venn diagram New Jersey Student Learning Assessment – Grade 8: Science (NJSLA-S)

	includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4) **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. ● Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS4-5)	reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)		
Interdisciplinary ELA	**Interdisciplinary Mathematics**	**21st Century and Career Integration**	**Technology Integration**	**Core and Supplemental Instructional Materials**
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-LS4-1), (MSLS4-2), (MS-LS4-3), (MS-LS4-4) ,(MS-LS4-5) **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS4-1), (MS-LS4-3) **RST.6-8.9** Compare and contrast the information gained from	**MP.4** Model with mathematics. (MS-LS4-6) **6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-LS4-4), (MS-LS4-6) **6.SP.B.5** Summarize numerical data sets in relation to their context. (MS-LS4-4), (MS-LS4-6) . **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number,	**Patterns** Patterns can be used to identify cause and effect relationships. (MS-LS4-2) Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1), (MS-LS4- 3) **Cause and Effect** Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4), (MS-LS4-5), (MS-LS4-6)	**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. (MS-LS4-5)	Generation Genius Brain Pop

experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-3), (MS-LS4-4) **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-2), (MS-LS4-4) **WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-LS4-5) **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2), (MS-LS4-4) **SL.8.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS4-2), (MS-LS4-4) **SL.8.4** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS4-2), (MS-LS4-4)	or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1), (MS-LS4-2) **7.RP.A.2** Recognize and represent proportional relationships between quantities. (MS-LS4-4), (MS-LS4-6)			

Grade 6, 7, 8				
Physical Sciences				
MS-PS1		**Matter and Its Interactions**		
Learning Standard	**Science and Engineering Practices**	**Disciplinary Core Ideas**	**Resources**	**Assessments**
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-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when	**Developing and Using Models** Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems. ● Develop a model to predict and/or describe phenomena. (MS-PS1-1),(MS-PS1-4) ● Develop a model to describe unobservable mechanisms. (MS-PS1-5) **Analyzing and Interpreting Data** Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis	● **PS1.A: Structure and Properties of Matter** Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1) ● Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2), (MS-PS1-3) ● Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)	https://www.state.nj.us/education/modelcurriculum/sci/videos/ https://www.state.nj.us/education/aps/cccs/science/resources/QR68.pdf http://nstahosted.org/pdfs/ngss/resources/MatrixForK-12ProgressionOfScienceAndEngineeringPracticesInNGSS.8.14.14.pdf	Ask questions Define problems Develop and use models Plan and carry out investigations Analyze and interpret data Formative assessment Teacher observation Class discussion Venn diagram New Jersey Student Learning Assessment – Grade 8: Science (NJSLA-S)

thermal energy is added or removed. 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. MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*	to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. ● Analyze and interpret data to determine similarities and differences in findings. (MS-PS1-2) **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 knowledge, principles, and theories. ● Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MSPS1-6) **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods. ● Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and	● In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4) ● Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1) ● The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4) **PS1.B: Chemical Reactions** ● Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2), (MS-PS1-3), (MS-PS1-5) ● The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5) Some chemical reactions release energy, others store energy. (MS-PS1-6) **PS3.A: Definitions of Energy** ● The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second		

	describe how they are supported or not supported by evidence. (MS-PS1-3)	meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MSPS1-4) ● The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (secondary to MS-PS1-4) **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. (secondary to MS-PS1-6) **ETS1.C: Optimizing the Design Solution** ● Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design. (secondary to MS-PS1-6)		

		• The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (secondary to MS-PS1-6)		
Interdisciplinary ELA	**Interdisciplinary Mathematics**	**21st Century and Career Integration**	**Technology Integration**	**Core and Supplemental Instructional Materials**
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS1-2), (MSPS1-3) **RST.6-8.3** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6) **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-1), (MS-PS1-2), (MS-PS1-4), (MS-PS1-5) **WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS1-6) **WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase	**MP.2** Reason abstractly and quantitatively. (MS-PS1-1), (MS-PS1-2), (MS-PS1-5) **MP.4** Model with mathematics. (MS-PS1-1), (MS-PS1-5) **6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1), (MS-PS1-2), (MS-PS1-5) **6.NS.C.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS1-4) **8.EE.A.3** Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. (MS-PS1-1) **6.SP.B.4** Display numerical data in plots on a number line, including dot plots, histograms, and box plots. (MS-PS1-2)	**Patterns** Macroscopic patterns are related to the nature of microscopic and atomic-level structure. (MS-PS1-2) **Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4) **Scale, Proportion, and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1) **Energy and Matter** Matter is conserved because atoms are conserved in physical and chemical processes. (MS-PS1-5) The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS1-6) **Structure and Function** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)	**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. (MS-PS1-3) **Influence of Science, Engineering and Technology on Society and the Natural World** The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)	Generation Genius Brain Pop

the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-PS1-3)	**6.SP.B.5** Summarize numerical data sets in relation to their context (MS-PS1-2)			

Grade 6, 7, 8				
Physical Sciences				
MS-PS2		**Motion and Stability: Forces and Interactions**		
Learning Standard	**Science and Engineering Practices**	**Disciplinary Core Ideas**	**Resources**	**Assessments**
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-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. 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.	**Asking Questions and Defining Problems** Asking questions and defining problems in grades 6–8 builds from grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models. ● Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations	**PS2.A: Forces and Motion** ● For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1) ● The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a	https://www.state.nj.us/education/modelcurriculum/sci/videos/ https://www.state.nj.us/education/aps/cccs/science/resources/QR68.pdf http://nstahosted.org/pdfs/ngss/resources/MatrixForK-12ProgressionOfScienceAndEngineeringPracticesInNGSS.8.14.14.pdf	Ask questions Define problems Develop and use models Plan and carry out investigations Analyze and interpret data Formative assessment Teacher observation Class discussion Venn diagram New Jersey Student Learning Assessment – Grade 8: Science (NJSLA-S)

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.	and scientific principles. (MS-PS2-3) **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 or design 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. (MS-PS2-2) ● Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation. (MS-PS2-5) **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	larger change in motion. (MS-PS2-2) ● All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MSPS2-2) **PS2.B: Types of Interactions** ● Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3) ● Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4) ● Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (MS-PS2-5)		

	consistent with scientific ideas, principles, and theories. ● Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1) **Engaging in Argument from Evidence** Engaging in argument from evidence in 6–8 builds from 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. ● Construct and present oral and written arguments 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. (MS-PS2-4)			
Interdisciplinary ELA	**Interdisciplinary Mathematics**	**21st Century and Career Integration**	**Technology Integration**	**Core and Supplemental Instructional Materials**
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS2-1), (MSPS2-3) **RST.6-8.3** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS2-1), (MS-PS2-2), (MS-PS2- 5) **WHST.6-8.**1 Write arguments focused on discipline-specific content. (MS-PS2-4) **WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated	**MP.2** Reason abstractly and quantitatively. (MS-PS2-1), (MS-PS2-2), (MS-PS2-3) **6.NS.C.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS2-1) **6.EE.A.2** Write, read, and evaluate expressions in which letters stand for numbers. (MS-PS2-1), (MS-PS2-2)	**Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS2-3), (MS-PS2- 5) **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-PS2-1), (MS-PS2-4) **Stability and Change** Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time	**Influence of Science, Engineering, and Technology on Society and the Natural World** The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-PS2-1)	Generation Genius Brain Pop

question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS2-1), (MS-PS2-2), (MS-PS2-5)	**7.EE.B.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-PS2-1), (MS-PS2-2) **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-PS2-1), (MS-PS2-2)	and forces at different scales. (MS-PS2-2)		

Grade 6, 7, 8				
Physical Sciences				
MS-PS3		**Energy**		
Learning Standard	**Science and Engineering Practices**	**Disciplinary Core Ideas**	**Resources**	**Assessments**
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.	**Developing and Using Models** Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop a model to describe unobservable mechanisms. (MS-PS3-2)	• **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)	https://www.state.nj.us/education/modelcurriculum/sci/videos/ https://www.state.nj.us/education/aps/cccs/science/resources/QR68.pdf http://nstahosted.org/pdfs/ngss/resources/MatrixForK-12ProgressionOfScienceAndEngineeringPracticesInNGSS.8.14.14.pdf	Ask questions Define problems Develop and use models Plan and carry out investigations Analyze and interpret data Formative assessment Teacher observation Class discussion Venn diagram

MS-PS3-3. Apply scientific principles to design, construct, and test a device that either 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.	**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 or design 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. (MS-PS3-4) **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. ● Construct and interpret graphical displays of data to identify linear and nonlinear relationships. (MS-PS3-1) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and	● Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3), (MS-PS3-4) **PS3.B: Conservation of Energy and Energy Transfer** ● 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) **PS3.C: Relationship Between Energy and Forces** ● When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2) **ETS1.A: Defining and Delimiting an Engineering Problem** ● The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (secondary to MS-PS3-3)		New Jersey Student Learning Assessment – Grade 8: Science (NJSLA-S)

	progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. ● Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system. (MS-PS3-3) **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. ● Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. (MS-PS3-5)	**ETS1.B: Developing Possible Solutions** ● A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (secondary to MS-PS3-3)		
Interdisciplinary ELA	**Interdisciplinary Mathematics**	**21st Century and Career Integration**	**Technology Integration**	**Core and Supplemental Instructional Materials**

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-PS3-1), (MSPS3-5) **RST.6-8.3** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS3-3), (MS-PS3-4) **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-1) **WHST.6-8.1** Write arguments focused on discipline content. (MS-PS3-5) **WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS3-3), (MS-PS3-4) **SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS3-2)	**MP.2** Reason abstractly and quantitatively. (MS-PS3-1), (MS-PS3-4), (MS-PS3-5) **6.RP.A.1** Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3-1), (MS-PS3-5) **6.RP.A.2** Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. (MS-PS3-1) **7.RP.A.2** Recognize and represent proportional relationships between quantities. (MS-PS3-1), (MS-PS3-5) **8.EE.A.1** Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1) **8.EE.A.2** Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. (MS-PS3-1) **8.F.A.3** Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS3-1),	**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** 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. (MSPS3-3)		Generation Genius Brain Pop

	(MSPS3-5) **6.SP.B.5** Summarize numerical data sets in relation to their context. (MS-PS3-4)			

Grade 6, 7, 8				
Physical Sciences				
MS-PS4		**Waves and Their Applications in Technologies for Information Transfer**		
Learning Standard	**Science and Engineering Practices**	**Disciplinary Core Ideas**	**Resources**	**Assessments**
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.	**Developing and Using Models** Modeling in 6–8 builds on K–5 and progresses to developing, using, and revising models to describe, test, and predict more	**PS4.A: Wave Properties** ● A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1) ● A sound wave needs a medium through which		Ask questions Define problems Develop and use models Plan and carry out investigations Analyze and interpret data Formative assessment

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.	abstract phenomena and design systems. ● Develop and use a model to describe phenomena. (MS-PS4-2) **Using Mathematics and Computational Thinking** Mathematical and computational thinking at the 6–8 level builds on K–5 and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments. ● Use mathematical representations to describe and/or support scientific conclusions and design solutions. (MS-PS4-1) **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating information in 6-8 builds on K-5 and progresses to evaluating the merit and validity of ideas and methods. ● Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings. (MS-PS4-3)	it is transmitted. (MS-PS4-2) **PS4.B: Electromagnetic Radiation** ● When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-2) ● The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (MS-PS4-2) ● A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS4-2) ● However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2) **PS4.C: Information Technologies and Instrumentation** ● Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3)		Teacher observation Class discussion Venn diagram New Jersey Student Learning Assessment – Grade 8: Science (NJSLA-S)
Interdisciplinary ELA	**Interdisciplinary Mathematics**	**21st Century and Career Integration**	**Technology Integration**	**Core and Supplemental Instructional Materials**

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-PS4-3) **RST.6-8.2** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-PS4-3) **RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-PS4-3) **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3) **SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS4-1), (MS-PS4-2)	**MP.2** Reason abstractly and quantitatively. (MS-PS4-1) **MP.4** Model with mathematics. (MS-PS4-1) **6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS4-1) **6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS4-1) **7.RP.A.2** Recognize and represent proportional relationships between quantities. (MS-PS4-1) **8.F.A.3** Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS4-1)	**Patterns** Graphs and charts can be used to identify patterns in data. (MS-PS4- 1) **Structure and Function** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS4-2) Structures can be designed to serve particular functions. (MS-PS4-3)	**Influence of Science, Engineering, and Technology on Society and the Natural World** Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations. (MS-PS4-3)	Generation Genius Brain Pop

Modifications/Accommodations

ELL	Alternate responses, extended time, teacher modeling, simplified directions, vocabulary banks, manipulatives, nonverbal responses, sentence frames, prompts, partner talk, advance notes
Special Education	Enlarged graph paper, small group instruction, highlighted instructions/keywords and/or computation signs, hands on activities, visual cues, number line, modified assessment, models, use of calculator, enlarged coordinate grid paper
G&T	Enrichment activities, centers, projects, flexible grouping, interest centers, learning log, extension activities, small group