Science Curriculum 6 - 8

Middle School

Ogdensburg School District

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CONTENTS

Rationale

Ogdensburg Borough Public School creates a foundation for students to understand the world around them. Understanding the world and universe occurs as students work collaboratively. Providing experiences that lead to curiosity and inquiry offers the opportunity for students to ask questions, develop tests, examine results, and evaluate scientific ideas. First hand experiences are integral for students to develop students' efficacy in their understanding of the world and universe.

Mission

Ogdensburg Borough Public School students will possess an understanding of scientific concepts and processes required for personal decision-making, participation in civic life, and preparation for careers in STEM fields (upon choice).

Vision

Ogdensburg Borough Public School prepares students to become scientifically literate individuals who can effectively:

- Apply scientific thinking, skills, and understanding to real-world phenomena and problems;
- Engage in systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned;
- Conduct investigations, solve problems, and engage in discussions;
- Discuss open-ended questions that focus on the strength of the evidence used to generate claims;
- Read and evaluate multiple sources, including science-related articles and web-based resources to gain knowledge about science problems and solutions and develop well-reasoned claims; and
- Communicate ideas through journal articles, reports, and presentations that explain and argue.

Scientific and Engineering Practices - All Grades	
Asking Questions and Defining Problems	• A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world works and which can be empirically tested. • Engineering questions clarify problems to determine criteria for successful solutions and identify constraints to solve problems about the designed world. • Both scientists and engineers also ask questions to clarify the ideas of others
Planning and Carrying Out Investigations	• Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters. • Engineering investigations identify the effectiveness, efficiency, and durability of designs under different conditions.
Analyzing and Interpreting Data	• Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis. • Engineering investigations include analysis of data collected in the tests of designs. This allows comparison of different solutions and determines how well each meets specific design criteria—that is, which design best solves the problem within given constraints. Like scientists, engineers require a range of tools to identify patterns within data and interpret the results. Advances in science make analysis of proposed solutions more efficient and effective.
Developing and Using Models	• A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations. • Modeling tools are used to develop questions, predictions and explanations; analyze and identify flaws in systems; and communicate ideas. Models are used to build and revise scientific explanations and proposed engineered systems. • Measurements and observations are used to revise models and designs.
Constructing Explanations and Designing Solutions	• The products of science are explanations and the products of engineering are solutions. • The goal of science is the construction of theories that provide explanatory accounts of the world. A theory becomes accepted when it has multiple lines of empirical evidence and greater explanatory power of phenomena than previous theories.

	● The goal of engineering design is to find a systematic solution to problems that is based on scientific knowledge and models of the material world. Each proposed solution results from a process of balancing competing criteria of desired functions, technical feasibility, cost, safety, aesthetics, and compliance with legal requirements. The optimal choice depends on how well the proposed solutions meet criteria and constraints.
Engaging in Argument from Evidence	● Argumentation is the process by which explanations and solutions are reached. In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation to listen to, compare, and evaluate competing ideas and methods based on merits. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to identify strengths and weaknesses of claims.
Using Mathematics and Computational Thinking	● In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; statistically analyzing data; and recognizing, expressing, and applying quantitative relationships. ● Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions. Statistical methods are frequently used to identify significant patterns and establish correlational relationships.
Obtaining, Evaluating, and Communicating Information	● Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. ● Critiquing and communicating ideas individually and in groups is a critical professional activity. ● Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations as well as orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to acquire information that is used to evaluate the merit and validity of claims, methods, and design.

Middle School

PACING GUIDE

PHYSICAL SCIENCE	GRADE 6	GRADE 7	GRADE 8
Unit 1 Matter and its Interactions (MS-PS1-1 to MS-PS1-6)	30 days	10 days	45 days
Unit 2 Motion and Stability: Forces and Interactions (MS-PS2-1 to MS-PS2-5)			45 days
Unit 3 Energy (MS-PS3-1 - MS-PS3-5)			40 days
Unit 4 Waves and their Applications in Technologies for Information Transfer (MS-PS4-1 to MS-PS4-3)			40 days
LIFE SCIENCE	30 days		
Unit 5 From Molecules to Organisms: Structures and Processes		40 days	5 days
Unit 6 Ecosystems: Interactions, Energy, and Dynamics		40 days	5 days
Unit 7 Heredity		40 days	5 days
Unit 8 Biological Evolution: Unity and Diversity		40 days	5 days
EARTH SCIENCE			
Unit 9 Earth's Place in the Universe	60 days	10 days	5 days
Unit 10 Earth and Human Activity	60 days		5 days
Engineering Design (MS-ETS1-1 to MS-ETS1-4)	Throughout units 1 - 8		

ENDURING UNDERSTANDING:	● Models of the solar system explain astronomical observations. ● Models can show cyclic patterns of ellipses, tides, and seasons. ● Instruments and technologies connect engineering to objects in the solar system. ● Instruments and technologies obtain data to support theories and explain formation and evolution of the universe. ● Geoscience data helps in understanding the processes and events in Earth's history. ● Organizing concepts are used to investigate patterns, scale, proportion, quantity, systems, and modeling.

	● Proficiency in using models, analyzing data, constructing explanations, and designing solutions assists in understanding scientific core ideas. ● Earth's geosystems operate by modeling the flow of energy and cycling matter within and among different systems. ● Investigating controlling properties of important materials and constructing explanations based on analysis improves understanding of geoscience. ● Model ways that geoscience processes provide resources needed by society. ● Geosciences processes can cause natural hazards that present risks to society. ● Technology can be used for identification and development of resources ● Identify factors that control weather. ● Energy from the sun is transferred between systems and circulates through the ocean and atmosphere. ● Use models, plan and carry out investigations, analyze and interpret data, and construct explanations; to demonstrate understanding of the core ideas. ● Human activities impact the Earth's other systems. ● Significant and complex issues surround juman uses of land, energy, mineral, and water resources and the impacts of their development. ● Aski questions, develop and use models, analyze and interpret data, construct explanations and design solutions and engage in argument; and to use these practices to demonstrate understanding of the core ideas. ● Gather information and use it to support explanations of the structure and function relationship of cells. ● Communicate an understanding of cell theory. ● Cells play a specific role in body systems. ● Body systems support life functions of an organism. ● Cells provide support for photosynthesis and movement of matter and energy needed for the cell. ● Environmental and genetic factors affect growth of organisms. ● Some plants depend on animal behavior for plant reproduction. ● Use analysis, interpretation of data, models to more deeply understand resources and cycling of matter and the flow of energy in ecosystems. ● Organisms interact within an ecosystem. ● Biotic and abiotic factors affect populations. ● Models can describe ways genes mutate and reproduction contributes to genetic variations. ● Use evidence to explain understandings of natural selection and evolution. ● Genetic variation in populations make sense of organisms surviving and reproducing.

	● Anatomical similarities of the relationships among organisms and species can be understood through fossil records. ● Patterns and structure contribute to the understanding of biological evolution. ● Matter and its Interactions is broken down into two sub-ideas: the structure and properties of matter, and chemical reactions. ● Pure substances have characteristic physical and chemical properties ● Pure substances are made from a single type of atom or molecule. ● Molecular accounts can explain states of matter and changes between states that are chemical reactions. ● Chemical reactions involve regrouping of atoms to form new substances. ● Atoms rearrange during chemical reactions. ● Understand the design and the process of optimization in engineering to chemical reaction systems. ● Apply Newton's Third Law of Motion to relate forces to explain the motion of objects. ● Use gravitational, electrical, and magnetic forces to explain a variety of phenomena including beginning ideas about why some materials attract each other while others repel. ● Objects can exert forces on each other even though the objects are not in contact, through fields. ● Engineering practices and concepts can solve a problem caused when objects collide. ● Interactions of objects can be explained and predicted using the concept of transfer of energy from one object or system of objects to another. ● Objects that are moving have kinetic energy and objects may also contain stored (potential) energy, depending on their relative positions. ● Know the difference between energy and temperature, and begin to develop an understanding of the relationship between force and energy. ● Crosscutting concepts of scale, proportion, and quantity; systems and system models; and energy are called out as organizing concepts for these disciplinary core ideas. ● Describe and predict characteristic properties and behaviors of waves when the waves interact with matter.
ESSENTIAL QUESTIONS:	● What is Earth's place in the Universe? ● What makes up our solar system? ● How can the motion of Earth explain seasons and eclipses? ● How do people figure out that the Earth and life on Earth have changed through time? ● How do the materials in and on Earth's crust change over time? ● How does the movement of tectonic plates impact the surface of Earth? ● How does water influence weather? ● How have living organisms changed the Earth?

	● How have Earth's changing conditions impacted living organisms? ● How is the availability of needed natural resources related to naturally occurring processes, ● How can natural hazards be predicted, ● How do human activities affect Earth systems? ● How do we know our global climate is changing? ● How can one explain the ways cells contribute to the function of living organisms? ● How does a system of living and non-living things operate to meet the needs of the organisms in an ecosystem? ● How do living organisms pass traits from one generation to the next? ● How do organisms change over time in response to changes in the environment? ● How do atomic and molecular interactions explain the properties of matter that we see and feel? ● How can one describe physical interactions between objects and within systems of objects? ● How can energy be transferred from one object or system to another? ● What are the characteristic properties of waves and how can they be used?

PHYSICAL SCIENCE

Middle School Physical Science

Core Ideas **Physical Science**	**Crosscutting Concepts**
● 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) ○ 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	● 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), (MS-PS2-3), (MS-PS2-5) ● Scale, Proportion, and Quantity ○ Time, space, and energy phenomena can be observed

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 meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4)
    - 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)
- PS2.A: Forces and Motion
    - For any pair of interacting objects, the force exerted by the first object on the

at various scales using models to study systems that are too large or too small. (MS-PS1-1)
    - 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)
- 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), (MS-PS3-3)
    - Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). (MS-PS3-5)
- 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), (MS-PS4-2)
    - Structures can be designed to serve particular functions. (MS-PS4-3)

second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1) ○ The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2) ○ All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MS-PS2-2) ● PS2.B: Types of Interactions ○ Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3) ○ Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4) ○ Forces that act at a distance (electric, 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) ● PS3.A: Definitions of Energy ○ Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1) ○ A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2) ○ Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter 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	● 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) ○ Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations. (MS-PS4-3) ● Scientific Knowledge is Based on Empirical Evidence ○ Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS1-2), (MS-PS2-2), (MS-PS2-4), (MS-PS3-4),

○ When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2) ● ETS1.A: Defining and Delimiting an Engineering Problem ○ The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (secondary to MS-PS3-3) ● ETS1.B: Developing Possible Solutions ○ A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (secondary to MS-PS3-3) ● PS4.A: Wave Properties ○ A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1) ○ A sound wave needs a medium through which it is transmitted. (MS-PS4-2) ● 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)	(MS-PS3-5) ● Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena ○ Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5) ● 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), (MS-PS3-2) ● Stability and Change ○ Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. (MS-PS2-2)

Science and Engineering Practices Physical Sciences
● Develop a model to predict and/or describe phenomena. (MS-PS1-1), (MS-PS1-4), (MS-PS4-2) ● Develop a model to describe unobservable mechanisms. (MS-PS1-5) ● Analyze and interpret data to determine similarities and differences in findings. (MS-PS1-2)

- Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)
- 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-PS1-3)
- 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 and scientific principles. (MS-PS2-3)
- Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1), (MS-PS3-3)
- 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), (MS-PS3-5)
- Develop a model to describe unobservable mechanisms. (MS-PS3-2)
- 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)
- Construct and interpret graphical displays of data to identify linear and nonlinear relationships. (MS-PS3-1)
- Use mathematical representations to describe and/or support scientific

Middle School Physical Science

PERFORMANCE EXPECTATIONS	**Matter and its Interactions** 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 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.
PERFORMANCE EXPECTATIONS	**Motion and Stability: Forces and Interactions** 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. 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.
PERFORMANCE EXPECTATIONS	**Energy** MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. MS-PS3-2 Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. MS-PS3-3 Apply scientific principles to design, construct, and test a device that either 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.
PERFORMANCE EXPECTATIONS	**Waves and Their Applications for Information Transfer** MS-PS4-1 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. MS-PS4-3 Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals

Interdisciplinary Connections		
PHYSICAL SCIENCE		
MATH ● **MP.2** Reason abstractly and quantitatively. (MS-PS1-1), (MS-PS1-2), (MS-PS1-5), (MS-PS3-1), (MS-PS3-4), (MS-PS3-5) (MS-PS3-1), (MS-PS3-4), (MS-PS3-5)	**ELA** ● **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	

• **MP.4** Model with mathematics. (MS-PS1-1), (MS-PS1-5) • **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) • **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), (MS-LS2-5) • **7.RP.A.2** Recognize and represent proportional relationships between quantities. (MS-PS3-1), (MS-PS3-5) • **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.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 $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. (MS-PS3-1) • **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.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	(MS-PS1-2), (MS-PS1-3), (MS-PS2-1), (MS-PS2-3), (MS-PS3-1), (MS-PS3-5), (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.6-8.3** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6), . (MS-PS2-1), (MS-PS2-2), (MS-PS2-5), . (MS-PS3-3), (MS-PS3-4) • **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) • **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), (MS-PS2-1), (MS-PS2-2), (MS-PS2-5), (MS-PS3-1) • **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 question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS1-6), (MS-PS2-1), (MS-PS2-2), (MS-PS2-5), (MS-PS3-3), (MS-PS3-4) • **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-PS1-3) • **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research.	

equation. (MS-LS2-3) ● **6.SP.B.4** Display numerical data in plots on a number line, including dot plots, histograms, and box plots. (MS-PS1-2) ● **6.SP.B.5** Summarize numerical data sets in relation to their context (MS-PS1-2), . (MS-LS2-2), (MS-PS3-4) ● **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), (MS-PS3-5)	(MS-PS4-3) ● **SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS3-2), (MS-PS4-1), (MS-PS4-2)	

LIFE SCIENCE

Middle School Life Science

Core Ideas **Physical Science**	**Crosscutting Concepts**
● 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.	● Cause and Effect ○ Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8), (MS-LS2-1), . (MS-LS3-2) ○ Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4), (MS-LS1-5), . (MS-LS4-4), (MS-LS4-5),

(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
    - 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 oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)
- 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. (MS-LS4-6)
- 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 may have subsystems 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)
    - The transfer of energy can be tracked as energy flows through a natural system. (MS-LS2-3)
- 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), (MS-LS3-1)
- Interdependence of Science,

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 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) ● LS1.B: Growth and Development of Organisms ○ Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2) ● 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 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)	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), (MS-LS4-5) ● Science is a Human Endeavor ○ Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3) ○ Scientific Knowledge is Based on Empirical Evidence Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6) ● Patterns ○ Patterns can be used to identify cause and effect relationships. (MS-LS2-2), (MS-LS4-2) ○ Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1), (MS-LS4-3) ● Stability and Change ○ Small changes in one part of a system might cause large changes in another part. (MS-LS2-4), (MS-LS2-5) ● Influence of Science, Engineering, and Technology on Society and the

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) ● 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 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 onto 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 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)	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) ● Scientific Knowledge Assumes an Order and Consistency in Natural Systems ○ Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3), (MS-LS4-1), (MS-LS4-2) ● Science Addresses Questions About the Natural and Material World ○ Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS2-5), (MS-LS4-5) ● Scientific Knowledge is Based on Empirical Evidence ○ Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4) ○ Science knowledge is based

	upon logical and conceptual connections between evidence and explanations. (MS-LS4-1)

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Science and Engineering Practices Life Sciences
● Develop and use a model to describe phenomena. (MS-LS1-2), (MS-LS2-3), (MS-LS3-1), (MS-LS3-2) ● Develop a model to describe unobservable mechanisms. (MS-LS1-7) ● Conduct an investigation to produce data to serve as the basis for evidence that meets the goals of an investigation. (MS-LS1-1) ● 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) ● 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) ● 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), (MS-LS4-5) ● Analyze and interpret data to provide evidence for phenomena. (MS-LS2-1) ● Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2) ● 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) ● 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) ● Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6) ● Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. (MS-LS4-2) ● Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4) ●

Middle School Life Science

PERFORMANCE	From Molecules to Organisms: Structures and Processes

EXPECTATIONS	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. -- Develop evidence that living things are made of cells. -- Distinguish between living and non-living things -- Living things can be made of one or many, varied 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. -- Identify primary role of parts of a cell -- Identify nucleus, chloroplasts, mitochondria, cell membrane, cell wall MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. -- Cells form tissues and tissues form organs specialized for particular body functions -- Interaction of subsystems within a system -- Circulatory, excretory, digestive, respiratory, muscular, nervous systems MS-LS1-4 Use argument 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. -- Include nest building, living in herds, vocalization, colorful plumage to protect the young -- Animal behaviors that affect probability of plant reproduction include transference of pollen or seeds, positive conditions for plant germination and growth -- Plant structures include bright flowers that attract butterflies along with flower nectar and odors that attract insects MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. -- Include availability of food, light, space, water -- Genetic factors could include large breed cattle or grass species affecting animal growth -- Fertilizer that affects plant growth -- Fish growing larger in larger bodies of water 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. -- Trace movement of matter and flow of energy MS-LS1-7 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism -- Energy is released when molecules are broken apart or pur back together 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.
	Ecosystems: Interactions, Energy, and Dynamics 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. -- Emphasize cause and effect relationships between resources and growth of organisms and numbers of organisms in ecosystems (consider abundant and scarce resources) MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. -- Consider relationships among and between organisms and abiotic components of an ecosystem -- Types includes competitive, predatory, and mutually beneficial MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. -- Describe conservation of matter and flow of energy MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. -- Emphasize patterns in data and making inferences in population changes MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services. -- Services could include water purification, nutrient recycling, prevention of soil erosion -- Consider constraints such as scientific, economic, and social considerations
PERFORMANCE EXPECTATIONS	**Heredity** 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. -- Emphasize changes in genetic material may result in making different proteins MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. -- Emphasize models such as Punnett squares, diagrams, and simulations
PERFORMANCE EXPECTATIONS	**Biological Evolution: Unity and Diversity** 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 natural laws operate today as in the past. -- Emphasize the patterns of change as anatomical structures become more complex -- Chronological order of fossils appear in rock layers 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.

	-- Explain evolutionary relationships among organisms in similarity or differences in appearance and anatomy 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. -- Infer general patterns of relatedness among embryos of different organisms (compare macroscopically using diagrams or pictures) 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. -- Use simple probability and proportional reasoning to construct explanations MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. -- Emphasize the influence of humans (genetic modifications, animal husbandry, gene therapy) 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. -- Use mathematical models, probability statements, and proportional reasoning to support explanations of trends in populations over time

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Interdisciplinary Connections		
LIFE SCIENCE		
MATH ● **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). (MS-LS2-3)	**ELA** ● **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), . (MS-LS2-1), (MS-LS2-2), (MS-LS2-4), (MS-LS3-2), (MS-LS4-1), (MS-LS4-2), (MS-LS4-3), (MS-LS4-4), (MS-LS4-5) ● **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) ● **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.,	

• **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. (MS-LS1-4), (MS-LS1-5) • **6.SP.B.4** Summarize numerical data sets in relation to their context. (MS-LS1-4), (MS-LS1-5), • **6.SP.B.5** Summarize numerical data sets in relation to their context. (MS-LS2-2), (MS-LS3-2) • **MP.4** Model with mathematics. (MS-LS2-5), (MS-LS3-2), (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.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-LS2-5) • **6.SP.B.5** Summarize numerical data sets in relation to their context. (MS-LS4-4), (MS-LS4-6) • **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1), (MS-LS4-2) • **7.RP.A.2** Recognize and represent proportional relationships between quantities. (MS-LS4-4), (MS-LS4-6)	in a flowchart, diagram, model, graph, or table). (MS-LS2-1), (MS-LS3-1), (MS-LS3-2), (MS-LS4-3) • **RST.6-8.8** Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5) • **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. (MS-LS1-3), (MS-LS1-4) • **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) • **RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-3), (MS-LS4-4) • **WHST.6-8.1** Write arguments focused on discipline content. (MS-LS1-3), (MS-LS1-4), (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-LS1-5), (MS-LS1-6), (MS-LS2-2), (MS-LS4-2), (MS-LS4-4) • **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), (MS-LS4-5) • **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5), (MS-LS1-6), (MS-LS2-2), (MS-LS2-4), . (MS-LS4-2), (MS-LS4-4) • **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), (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-LS2-2), (MS-LS4-2), (MS-LS4-4) ● **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), (MS-LS2-3), (MS-LS3-1), (MS-LS3-2)	

EARTH and SPACE SCIENCE

Middle School Earth and Space Science

Core Ideas **Physical Science**	**Crosscutting Concepts**
● **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.C**: The History of Planet Earth ○ Tectonic processes continually generate new ocean sea floor at ridges and destroy old seafloor 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 LargeScale 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	● Patterns ○ Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3) ○ Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2) ● Cause and Effect ○ Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5), (MS-ESS3-1), (MS-ESS3-4) ○ Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3) ● Scale Proportion and Quantity ○ Time, space, and energy

○ Water continually cycles among land, ocean, and atmosphere 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. (MS-ESS2-5) ○ 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) ● **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. (MS-ESS3-2) ● **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) for different living things. (MS-ESS3- 3)	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) ● Scientific Knowledge is Open to Revision in Light of New Evidence ○ Science findings are frequently revised and/or reinterpreted based on new evidence. (MS-ESS2-3) ● Stability and Change ○ Stability might be disturbed either by sudden events or gradual changes that accumulate over time.

○ 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) ● **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. (MSETS1-3) ○ 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, 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. (MS-ETS1-4)	(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) , (MS-ETS1-1) ○ 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), (MS-ETS1-1) ● Science Addresses Questions About the Natural and Material World ○ Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-ESS3-4)

Middle School Earth and Space Science

Science and Engineering Practices Earth and Space Sciences
● Develop a model to describe unobservable mechanisms. (MS-ESS2-4) ● Develop and use a model to describe phenomena. (MS-ESS2-1), (MS-ESS2-6) ● 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) ● Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3), (MS-ESS3-2) ● 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), (MS-ESS3-1) ● Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5) ● Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3) ● 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-ESS3-4) ● 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) ● Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4) ● Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3) ● Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)

Middle School Earth and Space Science

PERFORMANCE EXPECTATIONS	Earth's Place in the Universe
	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. -- Models can be physical, graphical, or conceptual MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. -- Model refers to gravity as the force that holds together the solar system and Milky Way -- Gravity controls orbital motion MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system. -- Emphasize analysis of data from Earth-based instruments, space-based telescopes, and spacecraft -- Determine similarities and differences among solar system objects -- Consider earth crust, atmosphere, volcanoes, orbital radius -- Include data from statistical information, drawings, photographs, and models

	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. -- Analysis of rock formations and fossils can establish relative ages of major Earth events -- Consider Earth events such as Earth formation, Ice Age, earliest homo sapien fossil, earliest evidence of Earth life, formation of mountain chains and ocean basins, evolution and /or extinction of organisms
	Earth and Human Activity 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. -- Emphasize that resources are limited and typically non-renewable -- Distribution of resources change as a result of removal by humans -- Consider petroleum, metal ores, volcanic and hydrothermal activity, marine sediment, soil erosion 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. -- Some natural hazards (volcanoes, severe weather) are phenomena that can be reliably predicted -- Surface processes, natural hazards, and severe weather are natural hazards -- Include data such as locations, magnitudes, frequency of the hazard -- Global and local technologies include satellite systems, reservoirs, building improvements MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. -- Examine human environmental impacts -- Assess feasible solutions -- Design and evaluate solutions that could reduce impacts of events 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. -- Evidence includes databases and rates of consumption -- Examine impacts through appearance, composition, structure of Earth's systems -- Human population increase cause consumption of natural resources MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused climate change over the past century. -- Fossil fuels combustion, cement production, and agricultural activity are factors that cause climate change -- Incoming solar radiation, volcanic activity are natural factors that cause climate change -- Evidence includes tables, graphs,global and regional maps and temperatures, atmospheric levels of gases
	MS-ETS Engineering Design
PERFORMANCE EXPECTATIONS	**Engineering and Design**

	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.

Middle School Earth and Space Science

Interdisciplinary Connections

EARTH and SPACE SCIENCE

MATH

- • **MP.2** Reason abstractly and quantitatively. (MS-ESS2-2), (MS-ESS2-3), (MS-ESS2-5), (MS-ESS3-2), (MS-ESS3-5)
- **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), (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-3),

ELA

- **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), (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-ESS2-3), (MS-ESS3-2)
- **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.6-8.1** 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-ESS2-2), (MS-ESS3-1)
- **WHST.6-8.7** Conduct short research projects to answer a

(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-ESS2-2), (MS-ESS2-3), . (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-3), (MS-ESS3-4), (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)	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-ESS2-5), (MS-ESS3-3) ● **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1), (MS-ESS3-4) ● **SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-1), (MS-ESS2-2), (MS-ESS2-6)	

RESOURCES

MATERIALS and RESOURCES:	INSTRUCTIONAL STRATEGIES	Technology Connections	21st C 9.1 Finance
Holt Gizmo Teacher Pay Teachers materials ● Presentation: Google Slides, Prezi, ● Video Tools: YouTube, Game-based ● Response Tools: Kahoot!, Socrative ● Communicative Tools: Google Apps for Education ● E-Portfolios: Google Drive, ● Authentic listening and reading sources that provide data and support for speaking and writing prompts. ● BrainPop ● Discovery Education ● StudyJams (scholastic) ● MOSA Mack ● Smart Exchange ● Manipulatives ● Science materials as appropriate to experimentation ● Gizmo ● Phet SImulations ● Mystery Science ● NSTA Science Books **GRADE 6** Earth Science, Holt Science and Technology Holt, Rinehart, and Winston, New York, 2001 **GRADE 7** Life Science, Holt Science and Technology Holt, Rinehart, and Winston, New York, 2001 **GRADE 8** Physical Science, Holt Science and Technology Holt, Rinehart, and Winston, New York, 2001	● Reinforcing effort ● Provide recognition ● Cooperative learning ● Cues, Questions, Organizers ● Summarizing (or note taking) ● Generating & testing hypotheses ● Student practice ● Individualized instruction ● Effective feedback ● Presenting learning goals/ objectives ● Blended learning ● Authentic learning ● Adapting to learning styles ● Conferencing ● Activate prior knowledge ● Investigations ● Graphic organizers ● Guest speakers ● Identifying similarities and differences ● Learning centers ● Modeling ● Music/ songs ● Peer teaching ● Project -based learning ● Reading aloud ● Debate ● Student choice ● Think- Pair- Share ● Rubrics ● Varied texts	Review Digital Citizenship with each grade using this guideline. **8.1.5.A.1** digital tools **8.1.5.A.2** enhance products digitally **8.1.5.A.3** graphic organizers **8.1.5.E.1** digital research **8.1.5F.1** collect & organize data	**CRP1** responsible citizenship **CRP4** communicate responsibly **CRP5** impacts of decisions **CRP6** creativity & innovation **CRP7** research **CRP8** critical thinking **CRP10** career education **CRP11** tech enhance productivity **9.1.8.E.3** fact vs. ads **9.1.8.E.8** deceptive advertising. **9.1.8.E.4** wants and needs **9.2.8.B.3** communication **9.2.8.B.1** career choices

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ASSESSMENTS:	**Grade 6** **Grade 7** **Grade 8**

SEL Competencies

Amistad

Holocaust

Italian American Heritage

REFERENCES

MIDDLE SCHOOL

MODIFICATIONS -SPECIAL NEEDS, 504 ● Pair visual prompts with verbal presentations ● Ask students to restate information, directions,	**STUDENTS AT RISK OF FAILURE** ● Ask students to restate information, directions, and assignments. ● Repetition and practice ● Model skills / techniques to	**GIFTED AND TALENTED** ● Use of technological device to gain access to online resources in order to research and explore current events and science	**ELL Modifications** ● Seat student near teacher ● Print clearly ● Do not use cursive ● Give directions in print & orally ● Print keywords, page numbers,

and assignments. ● Repetition and practice ● Model skills / techniques to be mastered. ● Extended time to complete class work ● Provide copy of ● class notes ● Preferential seating ● A student may request to use a computer to complete assignments. ● Establish expectations for correct spelling on assignments. ● Extra textbooks for home.	be mastered. ● Extended time to complete class work ● Provide copy of class notes ● Preferential seating ● A student may request to use a computer to complete assignments. ● Establish expectations for correct spelling on assignments. ● Extra textbooks for home. ● Assign a peer helper in the class setting ● Provide oral reminders and check student work during independent work time ● Assist student with long and short term planning of assignments ● Encourage student to proofread assignments and tests ● Provide regular parent/ school communication	topics and practices. ● Use advanced supplementary / reading materials ● Use of authentic resources to promote a deeper understanding of culture. ● Provide opportunities for open-ended, self-directed activities ● Encourage the use of creativity ● Provide opportunities to develop depth and breadth of knowledge in the subject area (examples: create drawings/illustrations, use of music, create poems/songs, write opinion letters, create videos/stories/comic strips, etc.) ● Conduct research and provide presentations of science topics.	homework, deadlines on the board ● Incorporate visuals ● Avoid slang or colloquial sayings, ● Avoid complex sentence structure ● Use questions that need one word answers ● Be ready to give additional instructions on complex tasks ● Adjust assignments so student writes less ● Provide simpler questions to answer ● Expect fewer spelling words ● Provide extra time as necessary ● Provide graphic organizers ● Provide an ELL dictionary ● Provide books on tape or CD ● Provide wall charts of key concepts ● Provide a word wall ● Provide models of docs such as Homework, projects ●

Bilingual/ESL Education: This website provides resources to help educators understand and implement effective instructional strategies for bilingual/ESL students.

Gifted & Talented: This website provides resources to help educators understand and implement effective instructional strategies for Gifted and Talented students.

Special Education: This website provides resources to help educators understand and implement effective instructional strategies for students with high frequency learning challenges.

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APPENDIX

New Jersey Statutes and Regulations

Ogdensburg Borough School District Policies and Regulations (Type "Curriculum" in the search bar)

OBSD Policy and Regulations Synopsis

Administrative Code[1]

New Jersey Administrative Code Summary and Statutes Curriculum Development:
Integration of 21st Century Skills and Themes and Interdisciplinary Connections

- District boards of education shall be responsible for the review and continuous improvement of curriculum and instruction based upon changes in knowledge, technology, assessment results, and modifications to the NJSLS, according to N.J.A.C. 6A:8-2. 1.
- District boards of education shall include interdisciplinary connections throughout the K–12 curriculum. 2. District boards of education shall integrate into the curriculum 21st century themes and skills (N.J.A.C. 6A:8-3.1(c)2).

Twenty-first century themes and skills integrated into all content standards areas (N.J.A.C. 6A:8-1.1(a)3).
"Twenty-first century themes and skills" means themes such as global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; learning and innovation skills, including creativity and innovation, critical thinking and problem solving, and communication and collaboration; information, media, and technology skills; and life and career skills, including flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, and leadership and responsibility.

From NJDOE : Please note that Administrative Code requires that the local curriculum include, but is not limited to:

1. A pacing guide;
2. A list of core instructional materials, including various levels of texts at each grade level;
3. Benchmark assessments; and
4. Modifications for special education students, for ELLs in accordance with N.J.A.C. 6A:15, for students at risk of school failure, and for gifted students.

[1] https://www.nj.gov/education/cccs/2020/NJSLS-Science.pdf
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Dissection Law
N.J.S.A. 18A:35-4.25 and N.J.S.A. 18A:35-4.24 authorizes parents or guardians to assert the right of their children to refuse to dissect, vivisect, incubate, capture or otherwise harm or destroy animals or any parts thereof as part of a course of instruction.

Amistad Law: N.J.S.A. 18A 52:16A-88
Every board of education shall incorporate the information regarding the contributions of AfricanAmericans to our country in an appropriate place in the curriculum of elementary and secondary school students.

Holocaust Law: N.J.S.A. 18A:35-28
Every board of education shall include instruction on the Holocaust and genocides in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35
A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36). A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.

Climate Change

Standards in Action: Climate Change

By its very nature, art has the power to inform or draw attention to a specific topic. It is always about something. In fact, the increasing prevalence of activist art in the past decade evidences the power of the arts to communicate big ideas. The aim of activist art is to change the world by inspiring people to take action against societal problems (Nurmis, 2016) – including global climate change. For example, when students engage in the creation and presentation of media artwork, or when devising a theatrical work exploring the social and economic implications of climate change (e.g., impacts on human health, agriculture, food security, water supply, transportation, energy systems, ecosystems), one might expect to see students working collaboratively to research the complex impacts of global climate change on the economy and quality of daily living for people throughout the world. Ultimately, by being culturally engaging, and tapping into the creative potential of the arts to shape perception, students can New Jersey Department of Education June 2020 4 contribute to imagining a new and better future for humankind (Curtis, Reid, & Ballard, 2012; Hulme, 2009; Marks, Chandler, & Baldwin, 2014; Nurmis, 2016) through their artwork. This holds true for students now, and as adults in the

workplace. It is not inconceivable that learning to leverage the capacity of the arts to raise awareness about the effects of climate change could yield employment opportunities focused on combating the negative effects of climate change and other societal global issues.

2020 New Jersey Model Curriculum, Storyline

2020 New Jersey Student Learning Standards Kindergarten through Grade 12

PHYSICAL SCIENCE PERFORMANCE EXPECTATIONS CHECKLIST

PS1: Matter and Its Interactions

PS	Grade and Unit
MS-PS1-1	
MS-PS1-2	
MS-PS1-3	

MS-PS1-4	
MS-PS1-5	
MS-PS1-6	

PS2: Motion and Stability: Forces and Interactions

PS	Grade and Unit
MS-PS2-1	
MS-PS2-2	
MS-PS2-3	
MS-PS2-4	
MS-PS2-5	

PS3: Energy

PS	Grade and Unit
MS-PS3-1	
MS-PS3-2	
MS-PS3-3	
MS-PS3-4	
MS-PS3-5	

PS4: Waves and Their Applications in Technologies for Information Transfer

PS	Grade and Unit
MS-PS4-1	
MS-PS4-2	
MS-PS4-3	

LIFE SCIENCE PERFORMANCE EXPECTATIONS CHECKLIST

LS1: From Molecules to Organisms: Structures and Processes

LS	Grade and Unit
MS-LS1-1	
MS-LS1-2	
MS-LS1-3	
MS-LS1-4	
MS-LS1-5	
MS-LS1-6	
MS-LS1-7	
MS-LS1-8	

LS2: Interactions, Energy, and Dynamics Relationships in Ecosystems

LS	Grade and Unit
MS-LS2-1	

MS-LS2-2	
MS-LS2-3	
MS-LS2-4	
MS-LS2-5	

LS3: Heredity: Inheritance and Variation of Traits

LS	Grade and Unit
MS-LS3-1	
MS-LS3-2	

LS4: Biological Evolution: Unity and Diversity

LS	Grade and Unit
MS-LS4-1	
MS-LS4-2	
MS-LS4-3	
MS-LS4-4	
MS-LS4-5	
MS-LS4-6	

ESS1: Earth's Place in the Universe

ESS	Grade and Unit
MS-ESS1-1	
MS-ESS1-2	
MS-ESS1-3	

ESS	Grade and Unit
MS-ESS2-1	
MS-ESS2-2	
MS-ESS2-3	
MS-ESS2-4	
MS-ESS2-5	
MS-ESS2-6	

ESS	Grade and Unit
MS-ESS3-1	
MS-ESS3-2	

MS-ESS3-3	
MS-ESS3-4	
MS-ESS3-5	