












Middle School - 8th Grade Physical Science

North Boone CUSD 200

UNITS (11/11 SELECTED)

SUGGESTED DURATION

 Unit 1: Nature of Science	<i>5 lessons</i>
 Unit 2: Gravity	<i>6 lessons</i>
 Unit 3: Newton's Laws	<i>26 lessons</i>
 Unit 4: Waves and their Applications in Technologies for information Transfer	<i>26 lessons</i>
 Unit 5: Electric and Magnetic Forces	<i>8 lessons</i>
 Unit 6: Energy and Energy Resources	<i>6 lessons</i>
 Unit 7: Thermal Energy	<i>18 lessons</i>
 Unit 8: Matter	<i>26 lessons</i>
 Unit 9: Properties and Interactions of Matter	<i>26 lessons</i>
 Unit 10: Engineering Practices ETS1-3	<i>9 lessons</i>
 Unit 11: Engineering Practice ETS1-1	<i>5 lessons</i>

Unit 1: Nature of Science

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

STANDARDS

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.

PRIORITY STANDARDS

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.
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DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Inquiry is used to solve problems</p> <p>Outcomes from inquiry and problem-solving are to used evaluate work</p> <p>Inquiry-based problem solving develops critical thinking skills</p> <p>Standardized scientific tools are used in scientific inquiry</p>	<p>Why are precision, clear definition of criteria and constraints, and testing important in the scientific inquiry and problem-solving process?</p> <p>How is scientific inquiry applied?</p>

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• The steps of the scientific method• How to develop a model• How to evaluate an experimental design	<ul style="list-style-type: none">• Carry out an investigation• Evaluate design models• Evaluate experimental designs

Unit 2: Gravity

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

STANDARDS

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.

PRIORITY STANDARDS

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Forces change the motion of objects.	What are the contact and non-contact forces and how do they differ? How do mass and distance affect gravitational forces? How does friction oppose motion?

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• The types of contact and non-contact forces• The difference between contact and non-contact forces• That forces have both strength and direction• The Law of universal gravitation and its impact on all matter• The types of friction and its effect on motion• Causes of friction and how to reduce its effect	<ul style="list-style-type: none">• Demonstrate the impact of both mass and distance on gravity through modeling.• Create and evaluate an investigation that demonstrates the 3 non-contact forces.

Unit 3: Newton's Laws

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

STANDARDS

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.

PRIORITY STANDARDS

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.

Unit 3: Newton's Laws

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Forces change the motion of objects</p> <p>Balanced (Newton's First Law of Motion) and unbalanced forces (Newton's Second Law of Motion) affect an object's motion.</p> <p>Forces always act in pairs-action and reaction</p> <p>Momentum stays the same unless an outside force acts upon it.</p>	<p>What are Newton's laws of motion and how do they affect the motion of objects?</p> <p>How is motion related to balanced and unbalanced forces?</p> <p>Why don't the forces in force pairs cancel each other out?</p> <p>What is the law of conservation of momentum?</p>

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Newton's first law• Forces can combine creating a net force.• Forces can combine in the same direction or opposite directions and this affects the motion of the object.• Balanced forces do not change the motion of an object• Unbalanced forces change the motion of an object• Inertia is the resistance to change of an object's motion• Unbalanced forces can change an object's velocity• Acceleration (Newton's 2nd Law) is an object's total net force divided by its mass.• Centripetal motion is the motion of objects along a curved path (orbits)• Newton's Third Law• Forces work in action-reaction force pairs• The force of on an object equals its change in momentum• The Law of conservation of momentum	<ul style="list-style-type: none">• Plan, conduct, and analyze an investigation showing evidence that the change in an object's motion depends on the force applied to the object and the mass of the object• Write a short report to explain the science involved in the shot-put event.• Use Newton's third law to design a solution that will prevent at least three out of five eggs from cracking when they are dropped and hit a model chicken-coop floor.• Develop designs within a set of constraints, test the design and evaluate for design improvements.• Calculate Force, mass or acceleration according to Newton's 2nd Law• Calculate momentum, mass or velocity according to The Newton's third law

Unit 4: Waves and their Applications in Technologies for information Transfer

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

STANDARDS

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.

PRIORITY STANDARDS

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.

Unit 4: Waves and their Applications in Technologies for information Transfer

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Waves carry energy not matter	What is a wave?
Waves interact through reflection, refraction, diffraction and interference	How do different types of waves make particles of matter move?
All waves have the properties of amplitude, wavelength and frequency	Can waves travel through empty space?
Vibrations in a medium produce sound	What are the properties of waves and how are they related?
Sound can be transmitted, reflected or absorbed by matter	What can affect wave speed?
The EM spectrum is the entire range of wavelengths and frequencies of electromagnetic waves	How is sound produced and how does it travel?
Electromagnetic waves travel through space and matter	What is the relationship among frequency, pitch and wavelength?
Matter can emit, absorb, reflect or transmit light	How do electromagnetic waves form and how do they differ?
	What are light sources and how does light travel?
	How do waves in general, and sound and light in particular, interact with matter?

Students will know (Knowledge):	Students will be able to (Skills)
<ul style="list-style-type: none"> Waves transmit energy not matter Electromagnetic waves can travel through a vacuum of space Mechanical waves need a medium to travel Transverse waves particles travel at right angles to the direction of the wave, longitudinal waves make particles move parallel to the wave direction 	<ul style="list-style-type: none"> Conduct experiments to determine the relationship between amplitude and energy. Present their findings as a summary statement intended for a middle-school audience. Research how analog and digital signals are transmitted and compare and contrast the scientific and technical information of each transmitting(contrast

Unit 4: Waves and their Applications in Technologies for information Transfer

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Students will know (Knowledge):	Students will be able to (Skills)
<ul style="list-style-type: none">• All waves have the properties of amplitude, wavelength, and frequency• The speed of a wave depends on the type and temperature of the material it is traveling through• Waves interact with matter through reflection, refraction, diffraction and interference• Sounds travel as compressions and rarefactions• Sound travels faster in materials where the particles are closer together• Sound can be transmitted, reflected or absorbed• Electromagnetic waves travel through space & matter.• Properties of electromagnetic waves include wavelength, frequency & radiant energy carried by the wave• Electromagnetic waves are used in radio and television broadcasting and in cell phone communications• Matter can emit, absorb, reflect or transmit light• Light rays reflect parallel from smooth surfaces and in many directions in rough surfaces.• Concave mirrors & convex lenses converge light rays.• Convex mirrors and concave lenses diverge light rays.• Light rays change directions as they move through different media.	<p>the quality and reliability of analog versus digital transmission) process.</p> <ul style="list-style-type: none">• Integrate information to write a short paragraph to their customers to explain why the cable company changing its transmission format.• Identify common materials used in a home that reflect, absorb, or transmit light waves or sound waves.• Develop a model to explain their use of certain materials to the client.• Describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.• Conduct research to find out how light and sound waves behave when they travel from one medium to another.• Choose one of these waves to model and identify common materials used in a home that reflect, absorb, or transmit light waves or sound waves.• Students will develop a model to explain their use of certain materials to the client.

Unit 5: Electric and Magnetic Forces

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STANDARDS

MS-PS2-3.: Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

PRIORITY STANDARDS

MS-PS2-3.	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
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Unit 5: Electric and Magnetic Forces

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Particles that have the same type of electric charge repel each other, and particles that have different types of electric charge attract each other.</p> <p>An electric discharge is a loss of static charge</p> <p>Objects become negatively charged when they gain electrons and positively charged when they lose electrons</p> <p>An electric current is the flow of electrically charged particles through a conductor</p> <p>All electric circuits have an energy source, wires, and a switch.</p> <p>Series circuits have only one path current flows. A parallel circuit has more than one path for current flow.</p> <p>A magnet is surrounded by a magnetic field that exerts forces on other magnets</p> <p>Magnetic materials have atoms that are grouped in domains</p> <p>A magnetic field exerts a force on any moving, electrically charged particle.</p> <p>An electric current is produced when a magnet and a closed wire loop move past each other.</p>	<p>What are the two types of interaction of electric and magnetic (electromagnetic) forces?</p> <p>On what do the sizes of electric and magnetic (electromagnetic) forces depend?</p>

Unit 5: Electric and Magnetic Forces

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Students will know (Knowledge):	Students will be able to (Skills)
<ul style="list-style-type: none">• How electrically charged objects interact• How objects become electrically charged• What an electric discharge is• The relationship between electric charge and electric current• What voltage, current, and resistance are and how they affect each other• The basic parts of an electric circuit• The two differences between the types of electric circuits• The forces magnets apply to other magnets• What makes materials magnetic• The difference between temporary and permanent magnets• How a magnet applies a force on an electric current• How electromagnets and permanent magnets differ• How an electric motor works• How a wire and a magnet produce an electric current• How electric generators create an electric current• How transformers are used to bring an electric current to your home	<ul style="list-style-type: none">• Research how electromagnets work and how they are made.• Make and test electromagnets to determine the factors that affect the strength of an electromagnet.• Collect and organize data to identify the trends that affect the strength of electromagnets.• Analyze their electromagnet based on the collected data to see if modifications are needed.

Unit 6: Energy and Energy Resources

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

STANDARDS

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-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-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.

PRIORITY STANDARDS

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.
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Unit 6: Energy and Energy Resources

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Energy is the ability to cause change.	What are motion energy and stored energy scientifically called? How is motion energy mathematically related to the mass and speed of a moving object? What determines whether a system of objects contains stored energy?

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Energy is the ability to cause change• Kinetic energy is the energy of motion• Potential energy is stored energy• Any form of energy can be transformed into other forms of energy.• Energy cannot be created or destroyed, only transferred from one form to another or from one region to another.• Friction transforms mechanical energy into thermal energy	<ul style="list-style-type: none">• Use toy cars and a board (to model a skateboard and skateboard ramp) to determine how the mass and speed of an object affect its kinetic energy.• Collect data and use it to construct graphs.• Analyze their graphs and use them to develop a presentation for the skateboard park's management team.• Research amusement park rides and attractions to determine areas of potential energy.• Summarize their analysis in paragraphs and illustrations to model the potential energy of the attractions.• Research the relationship between kinetic and potential energy.• Construct sketches to support an argument that an object's kinetic energy changes during different phases of a snowboarding competition.• Present and defend their argument, explaining why it is valid.

Unit 7: Thermal Energy

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

STANDARDS

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.

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-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.

PRIORITY STANDARDS

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-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-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.

Unit 7: Thermal Energy

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Thermal energy can be transferred by conduction, radiation, and convection.	<p>What is temperature and on what does its relationship to the total energy of a system depend?</p> <p>On what does the amount of energy transfer needed to change the temperature of matter depend?</p> <p>In what direction energy spontaneously transfer between hotter and colder regions?</p> <p>How does the scientific use of the term 'heat' differ from its use in everyday language?</p>

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• The temperature of a material is the average kinetic energy of the particles that make up the material.• Heat is the movement of thermal energy from a warmer region to a cooler region.• Thermal energy can be transferred through conduction, radiation, or convection.• When materials are heated, the thermal energy of the material increases and the material expands.• When a material has a low specific heat, transferring a small amount of energy to the material increases its temperature significantly.	<ul style="list-style-type: none">• Apply scientific principles to design, construct, and test a solar cooker that maximizes thermal energy transfer.• Use temperature measurements to evaluate the efficiency of their solar cookers.• Evaluate their solar cookers for weaknesses and make modifications as needed.• Plan an investigation to determine one of three relationships involved with energy transfer.• Identify the independent and dependent variables in their investigation.• Create a presentation that explains their investigation and expected results.

Unit 8: Matter

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

STANDARDS

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

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

MS-PS1-6.: Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*

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.

PRIORITY STANDARDS

MS-PS1-2.	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
MS-PS1-5.	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
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.

Unit 8: Matter

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>Matter is anything that has mass and takes up space. It has both physical and chemical properties that can change.</p> <p>As matter changes from one state to another, the distance between the particles changes and the amount of thermal energy changes.</p>	<p>What happens to atoms during chemical reactions?</p> <p>What happens to the properties of the reactants in a chemical reaction?</p> <p>What happens to mass during chemical reactions?</p> <p>What can happen to energy during chemical reactions?</p>

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• A substance is a type of matter that always is made of atoms in the same combinations.• Atoms of different elements have different numbers of protons• Matter can be classified as either a substance or a mixture.• The composition of a substance cannot vary; the composition of a mixture can vary.• Physical properties of matter include size, shape, texture, and state.• Physical properties such as density, melting point, boiling point, and size can be used to separate mixtures.• A change in energy can change the state of matter.• The masses before and after a change in matter are equal.• Chemical properties include the ability to burn, and the ability to rust.• Some signs that indicate chemical changes are the formation of bubbles and a change in odor, color or energy.	<ul style="list-style-type: none">• Identify examples of balanced chemical equations and use one of these equations to model the law of conservation of mass and present it to their families. Students will evaluate the effectiveness of their model and revise it accordingly.• Develop a model to demonstrate how particle motion, temperature, and state of a substance change when thermal energy is added or removed and use their models to teach the concepts to 4th graders. Students will evaluate their models and identify ways to improve them.

Unit 8: Matter

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Chemical equations are useful because they show what happens during a chemical reaction• Factors that can affect the rate of chemical reactions are temperature, concentration and surface area.• Particles vibrate in solids; move faster in liquids; and, move even faster in gases.• The force of attraction between particles decreases as matter goes from a solid, to a liquid, and finally to a gas.• Temperature is the average kinetic energy of the particles in matter. Kinetic energy depends on particle motion.• Thermal energy includes both the kinetic energy and the potential energy in matter.• Thermal energy must be added or removed from matter for a change of state to occur.• The kinetic molecular theory states basic assumptions that are used to describe particles and their interactions in gases and other states of matter.• The pressure of a gas increases if the volume decreases and the pressure of a gas decrease if the volume increases if the temperature remains constant.• Boyle's law describes the behavior of gas when pressure and volume change at a constant temperature.• Charles's law describes the behavior of gas when temperature and volume change and pressure is constant.	

Unit 9: Properties and Interactions of Matter

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

STANDARDS

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

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

PRIORITY STANDARDS

MS-PS1-1.	Develop models to describe the atomic composition of simple molecules and extended structures.
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Unit 9: Properties and Interactions of Matter

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

DESIRED RESULTS

Enduring Understandings	Essential Question(s)
<p>An atom is the smallest unit of an element and is made of mostly empty space.</p> <p>Elements are organized on the periodic table according to increasing atomic number and similar properties.</p> <p>Elements can join together by sharing, transferring, or pooling electrons to make chemical compounds.</p> <p>Atoms are neither created nor destroyed in chemical reactions. Energy can be released when chemical bonds form or absorbed when chemical bonds are broken.</p> <p>Solutions are homogeneous mixtures described by the concentration and type of solute they contain.</p> <p>Carbon is the foundation of life because of its ability to bond easily with other atoms.</p>	<p>What happens when atoms combine with one another in various ways?</p> <p>How many atoms can make up a molecule?</p> <p>How can we organize and analyze the atoms that comprise substances?</p>

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Key concepts and vocabulary associated with atoms, including their size, structure, and stability• Different elements contain different numbers of protons; isotopes contain different numbers of neutrons.• When a neutral atom gains or loses electrons it becomes an ion.• Key concepts and vocabulary associated with the periodic table of the elements, including: atomic number, organizational features (groups and periods), metals, non-metals, metalloids, and gases.	<ul style="list-style-type: none">• Research and evaluate different models of molecules.• Choose materials to build a model of a molecule that shows its atomic composition.• Develop a presentation using their models to teach fourth-grade students about the composition of atoms in molecules.• Write a story that contains physical changes and chemical changes.• Trade stories with another student and analyze the stories to identify and describe the changes in the stories.

Unit 9: Properties and Interactions of Matter

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Electrons with more energy are farther from an atom's nucleus and are in a higher energy level.• Atoms with fewer than eight valence electrons gain, lose or share valence electrons to form stable compounds.• Covalent bond forms when two nonmetal atoms share valence electrons. properties include low melting and boiling points and poor conductors.• Key concepts and vocabulary associated with compounds, including: chemical and physical properties; make-up of polar compounds; ionic and metallic bonds• Key concepts and vocabulary associated with chemical reactions, including: signs and indicators; reactants and products; conservation of total mass; types such as synthesis, decomposition, combustion, and single or double replacement; energy of bond breaking and forming; endothermic and exothermic; and how to increase rates• Key concepts and vocabulary associated with substances and mixtures, including: fixed vs varied composition; distinctions between solutions and heterogeneous mixtures; bonds and separations;• Key concepts and vocabulary associated with dissolving substances, including: polarity, concentration, solubility, effects of temperature and pressure on solubility• Key concepts and vocabulary associated with acids and bases, including: pH, hydrogen ions, hydronium ions, and hydroxide ions• Key concepts and vocabulary associated with biological molecules, including: groups of carbon compounds such as proteins, carbohydrates, nucleic acids, and lipids; four energy conserving covalent bonds; single, double, and triple carbon bonds with other carbon atoms; the carbon-hydrogen bonds of hydrocarbons; and monomers and polymers	<ul style="list-style-type: none">• Use evidence of physical and chemical changes to identify changes within a story.• Research the chemistry of heat packs and some actual commercial products.• Use their research to design, construct, and test a model hand-warmer heat pack with specific design constraints.• Write instructions for the hand-warmer as well as suggest ways to have the hand-warmer be sold commercially.• Research a sports helmet to find out that most are made of various layers of foam and plastic. Both of these are synthetic materials made from distillates of the natural resource petroleum (crude oil).• Identify how extracting and processing the oil impacts the environment while carefully evaluating the credibility, accuracy, and possible bias of their sources.• Write and present a report to describe their findings. They will make recommendations, which are supported by evidence, for possible alternative materials for the helmets.

Unit 10: Engineering Practices ETS1-3

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

STANDARDS

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.

PRIORITY STANDARDS

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.
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DESIRED RESULTS

Enduring Understandings	Essential Question(s)
Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors and can be incorporated into new design solutions.	How are engineering problems solved? Can different designs be used to create an improved design? How can engineers use data they collect?

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Engineering problems are best solved when criteria and constraints for solutions are precisely identified.• Multiple designs are often developed to determine the best possible design given the constraints and criteria.• Analyzing data from tests often results in an improved design solution.	<ul style="list-style-type: none">• Design and build a mousetrap-powered car with given constraints.• Use a given criteria that their car must meet in order to be considered successful.• Test and evaluate their designs and compare them to the designs of other groups.• Evaluate everyone's data in order to suggest more-efficient designs for mousetrap-powered cars.

Unit 11: Engineering Practice ETS1-1

Middle School - 8th Grade Physical Science - Last Updated on June 4, 2019

STANDARDS

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.

PRIORITY STANDARDS

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.
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DESIRED RESULTS

Enduring Understandings	Essential Question(s)
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.	What is the purpose of a design? What are design criteria and constraints? How can multiple designs help construct the best possible design? How can analyzing data improve solutions?

Students will know (Knowledge):	Students will be able to (Skills):
<ul style="list-style-type: none">• Engineering problems are best solved when criteria and constraints for solutions are precisely identified.• Multiple designs are often developed to determine the best possible design given the constraints and criteria.• Analyzing data from tests often results in an improved design solution.	<ul style="list-style-type: none">• Research commercial zip lines and use their findings to develop scale models of working zip lines, which include launching and landing platforms.• Develop a set of plans for their zip lines, and use the plans to construct and test a scale model zip line.• Identify potential problems associated with the construction and operation of zip lines and suggest ways to minimize them.• Write a specification sheet for the zip line builders.• Evaluate their design and identify ways to improve it.