**8th Grade Integrated Science Curriculum**

**Length of Course: Full Year**

**Course Description:**

The 8th grade science program will provide students with a thorough, relevant, and engaging standards-based curriculum that focuses on implementing the scientific and engineering practices as well as the cross-cutting concepts based on the core ideas. This course will emphasize problem-based learning experiences, 21st Century Skills, and engineering design processes in a supportive, challenging environment for all students. Classroom activities will include scientific investigations, application of research, and analyzing and interpreting data.

**Big Ideas:** Interactions of Matter in One World

**Quarter 1: Introduction to Chemistry**

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| **Essential Questions**  *What provocative questions will foster inquiry, understanding, and transfer of learning?*   1. How are elements classified as metals, nonmetals, and metalloids based on their chemical and physical properties? 2. How is density determined? 3. How does density affect floating and sinking of objects in different liquids? 4. How does the changes in mass/volume affect density? 5. How are properties of elements related to the arrangement on the periodic table? 6. How does a chemical reaction show the relationship between reactants and products? 7. How has the atomic model evolved over time? 8. What is the importance of an ion? 9. What is the difference between ionic and covalent bonding? 10. What elements are used to covalent bond? Ionic bond? 11. How do these elements bond? | **Enduring Understandings**  *What will students understand about the big ideas?*  Students will understand that…   * Changes in matter can be classified as chemical or physical * The law of conservation of mass states that mass is conserved when substances undergo physical and chemical changes. * Balanced chemical reactions demonstrate the law of conservation of mass * Chemical reactions are classified according to the number of reactants and products and the specific types of compounds involved. |
| **Areas of Focus: Proficiencies**  **(Cumulative Progress Indicators)**  Students will:  (*Enter NJCCCS or Common Core CPI’s here)*  **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-PS1-4:**  **Develop a model that predicts and describes changes in the 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.** | **Examples, Outcomes, Assessments**  *(see* [*note*](#kix.2y1fzlr0zzsc) *below about the content of this section)*  Instructional Focus:   * Components of a Lab Report   + Constants   + Controls   + Independent Variable   + Dependent Variable * Physical/ Chemical Changes and Properties   + Properties of an Element Lab * Mass v. Volume * Density   + Experiments   + Equation   + Calculations * Conservation of Mass * Periodic Table   + Layout   + Components   + Reactivity   + Experiments * Atomic Model   + History   + Bohr Model   + LEDS * Ions   + Identify them * Bonding   + Ionic   + Covalent     Sample Assessments:   * Benchmarks for units * Formal Assessments * Do Now * Exit Ticket * Surveys * Discussions * Homework * Flinn Scientific Lab/Demonstrations   + Periodic Activity of Metals Demonstration   + Think Tube Demonstration   + Atomic Target Practice   + How to….Covalent Bond * Atomic Dating Game Skit * Human Bohr Model * Lab Reports   + Chemistry Lab   + Density of Water Lab   + 7 Layer Density Column Lab   Instructional Strategies:   * Chemistry Lab * Chemistry Assessments * Density Demo: Salt Water & Golf Ball * Density Column * Calculations of Density Worksheet * Density Water Lab * Density Assessment * Periodic Table Station Rotation   + Dating Game * Quarter 1 Assessment   Interdisciplinary Connections   * Current Events * Writing Lab Reports * Mathematical Calculations     Technology Integration   * iPad * Google Classroom * Google Sites * Notability * Textbook * Flinn Scientific Labs/Demonstrations * Webquest * Video Clips     Global Perspectives   * Nonfiction/Fiction Articles from around the Globe on Science Topics * Globally Current Events * Chemistry advancements made in other countries   Culturally Responsive Teaching   * Different articles have the ability to allow the students to translate in their native language. * Acknowledging that each student comes from different backgrounds and culture; therefore, we will have discussions and surveys to bring the differences into the classroom |

**Quarter 2: Objects in Motion- *How does matter move and behave?***

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| **Essential Questions**  *What provocative questions will foster inquiry, understanding, and transfer of learning?*   1. How are scalars and vectors used to describe motion? 2. How is speed, velocity, and acceleration calculated to describe the motion of an object? 3. What are Newton’s 3 Laws? 4. How does Newton’s Laws explain and predict how objects move? 5. How does friction and an object’s momentum affect how it moves. 6. What is the relationship between kinetic and potential energy? 7. How can energy be transferred from one type to another? 8. How is the mass of an object and the force of the object related? 9. How are waves classified? 10. What are the properties used to describe waves? 11. Which type of signal is the most reliable to encode and transmit data? | **Enduring Understandings**  *What will students understand about the big ideas?*  Students will understand that…   * Scalars are quantities that are measured using only a numerical value, while vectors include both the numerical value and the direction. * Speed is a measurement of the distance an object moves over time. * Velocity is the speed of an object in a certain direction. * Newton’s three laws can explain and predict how objects move. * Different forces, such as friction can change how objects move. * The amount of kinetic and potential energy can vary depending on the mass of an object and its distance from the ground. * Energy is not lost or made, it is transferred to or from an object. * Waves are classified according to how they move. * Basic properties of waves include their amplitude, frequency, speed and wavelength. * Digitalized signals are more reliable way to encode and transmit data. |
| **Areas of Focus: Proficiencies**  **(Cumulative Progress Indicators)**  Students will:  (*Enter NJCCCS or Common Core CPI’s here)*  **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-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-PS3-5**  **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-PS4-1**  **use mathematical representations to describe a simple model for waves that include how the amplitude of a wave is related to the energy of 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.**  **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.** | **Examples, Outcomes, Assessments**  *(see* [*note*](#kix.y803ktxds3pa) *below about the content of this section)*  Instructional Focus:   * Speed, Velocity, and Acceleration * Newton’s Three Laws * Gravitational Force * Friction and Momentum * Kinetic Energy * Potential energy * Transformation of Energy * Collisional Forces * Types of waves and their properties * Digital vs. Analogue Signal Transmission     Sample Assessments:   * Formal Assessments * Do Now * Exit Ticket * Surveys * Discussions * Homework * Demonstrations   + Conservation of Energy Demo   + Waves Demo * Experiments/Lab Reports   + Bubble Gum Lab   + Vernier Lab: Graphing Your Motion 33   + JASON Virtual Coaster Building Activity   + Wave Properties Lab   + Analogue vs. Digital Lab * STEAM Reports   + Car Seat Belt Steam Report * STEAM Builds   + Car Seat Belt Steam Build     Instructional Strategies:   * Car Seat Belt Steam Build * Newton’s Laws Classroom Rotation Activities * Newton’s Laws Foldable * Newton’s Laws Webquest * JASON Virtual Coaster Activity * Kinetic/Potential Energy Benchmark Lesson * Vernier Lab: Speed, Velocity, Acceleration * Energy Transformation Stations * Introduction to Waves Benchmark   + Wave Properties Lab   + Wave Demonstrations * Digital vs. Analog Project   Interdisciplinary Connections   * Current Events * Writing Lab Reports/STEAM Reports * Mathematical Calculations     Technology Integration   * iPad * Google Classroom * Google Sites * Kahoot * Vernier Motion Detectors * JASON Digital Software * Video Clips   Global Perspectives   * Nonfiction/Fiction Articles from around the Globe on Science Topics * Globally Current Events * Science advancements made in the field of physics from other countries   Culturally Responsive Teaching   * Acknowledging that each student comes from different backgrounds and culture; therefore, we will have discussions and surveys to bring the differences into the classroom |

**Quarter 3: Patterns of Force, Energy, & Motion in Nature**

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| **Essential Questions**  *What provocative questions will foster inquiry, understanding, and transfer of learning?*   1. What are the similarities and differences between weather and climate? 2. Do human activities contribute to global climate change? 3. How does the analysis and interpretation of real time data predict global climate events? 4. What is the relationship between the atmosphere and the ocean? 5. How does the unequal heating of the Earth cause global wind patterns? 6. How does the interaction between the Sun, Earth, and Moon cause the phases of the moon, tides, and eclipses? 7. How does the Earth, Sun, and Moon relationship impact humans? 8. How does the tilt of the Earth cause seasonal changes? | **Enduring Understandings**  *What will students understand about the big ideas?*  Students will understand that…   * Weather is the minute by minute changes in the atmosphere. * Climate is the overall weather of a specific location over a long period of time. * Humans impact the environment in a negative/positive way. * Sea surface temperature maps and graphs of ocean currents can be used to predict changes in global climate. * The unequal heating of the earth creates pressure belts in the atmosphere causing predictable global wind patterns. * The phases of the moon from Earth and space are determined by the position of the moon relative to the Earth and the Sun. * The tilt of the Earth causes the seasonal changes. * The direct alignment of the Sun, Earth and moon causes lunar and solar eclipses. * The gravitational pull of the sun and the moon cause tides on Earth’s surface. * The angle of insolation from the sun affects the temperature of the Earth’s surface at different locations.. |
| **Areas of Focus: Proficiencies**  **(Cumulative Progress Indicators)**  Students will:  (*Enter NJCCCS or Common Core CPI’s here)*  **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-ESS1-1:**  **Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.**  **MS-ESS2-6:**  **Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.**  **MS-ESS3-2:**  **Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.**  **MS-ESS3-3:**  **Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.**  **MS-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.** | **Examples, Outcomes, Assessments**  *(see* [*note*](#kix.xa4gd4cdzqaa) *below about the content of this section)*  Instructional Focus:   * Climate Change * Corilois Effect * Global Winds * El Nino * Ocean Currents   + Satellite Image interpretations   + Weather Map Interpretations * Atmosphere * Moon Phases * Tides * Eclipses * Seasons   Sample Assessments:   * Formal Quiz/ Test Assessments * Do Now / Exit Tickets * Practice Worksheets * Research Notes * Debates   + RST Climate Change Debate * Homework * Experiments/Lab Reports   + Seasons Lab   + Penguin Thermal Lab * STEAM Reports * STEAM Builds     Instructional Strategies:   * Penguin Thermal Build * Weather vs.k Climate Skittles Activity * Climate Change Research and Debate * Coriolis Effect Lab/Activity * Global Winds Diagram * El Nino Unit   + Ocean Currents affecting weather   + Worksheets   + Maps Analysis   + Satellite Images Analysis   + El Nino Current Event Article * Atmospheric & Oceanic Current Assessment * Sun, Earth, Moon Unit   + “The Moon, Could Earth Survive Without it?” Video   + Gravity Activity Stations   + Moon Phases Activity List   + Tides Activity List   + Eclipses Activity List   + Seasons Worksheets/Activities/ Labs   Interdisciplinary Connections   * El Nino Current Events Article & Questions * Research on climate change and El Nino * Writing Lab Reports/STEAM Reports * Mathematical Calculations     Technology Integration   * iPad * Google Classroom * Google Sites * Interactive Wind Global Map * Library Databases * Vernier Temperature Probes * Video Clips     Global Perspectives   * Effects of El Nino on different countries around the world. * Effects of global climate change around the world * Science advancements in the study of El Nino   Culturally Responsive Teaching   * Students from different countries share their experiences with climate and seasons in their country. * Acknowledging that each student comes from different backgrounds and culture; therefore, we will have discussions and surveys to bring the differences into the classroom |

**Quarter 4: Impacts of the Environment on Living Things**

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| **Essential Questions**  *What provocative questions will foster inquiry, understanding, and transfer of learning?*   1. What is evolution? 2. Why is natural selection so important? 3. What is the evidence of evolution? 4. What does embryological data show? 5. Why is embryological data important? 6. How can scientist improve the human body? 7. What is the organization of the body? 8. What is the importance of the body systems? 9. How are the body systems interconnected? 10. How do memories work in the human brain? | **Enduring Understandings**  *What will students understand about the big ideas?*  Students will understand that…   * the human body systems are all interconnected and rely on one another. * each body system is composed of subsystems that are working together. * the organization of the body. * Cells and tissues are specialized according to their structure and function. * Organisms, especially humans, have interacting subsystems made up of specialized structures. * the nervous system is composed of specialized cells that help transmit messages to the brain. * evolutionary relationship of embryological similarities and differences. * Natural selection leads to the predominance of certain traits in a population. * Natural selection also leads to the suppression of certain traits in a population. * Humans have the capacity to influence certain characteristics/traits in an organism. * Technologies have changed the way humans influence the inheritance of desired traits in an organism. * Traits that support successful survival and reproduction in a new environment become more common; those that do not become less common. |
| **Areas of Focus: Proficiencies**  **(Cumulative Progress Indicators)**  Students will:  (*Enter NJCCCS or Common Core CPI’s here)*  **MS-LS1-3**  **Use argument supported by evidence for how the body is a system interacting subsystems composed of group of cells.**  **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.**  **MS-LS4-3**  **Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evidence in the fully formed anatomy.**  **MS-LS4-4**  **Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals’ probability of surviving and reproducing in a specific environment.**  **MS-LS4-5**  **Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.**  **MS-LS4-6**  **Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.**  **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.** | **Examples, Outcomes, Assessments**  *(see* [*note*](#kix.w3qdxlajoqmh) *below about the content of this section)*  Instructional Focus:   * Evolution * Survival of the Fittest   + Genetic Variation * Natural Selection   + Components of Natural Selection * Evidence of Evolution   + Fossil Record   + Anatomy Structure     - Vestigial     - Homologous   + Embryological Development   + DNA Comparison * Artificial Selection Techniques/ Technology   + Genetic Engineering   + Genetic Modification   + Cloning   + Gene Therapy   + Selective Breeding * Designer Babies   + GATTACA Movie   + PSA * Human Body   + Organization   + Body Systems     - Interactions between all systems * How to build a “better” body ( Better Body 2.0) * The Brain   + Components   + Functions   + Memory     Sample Assessments:   * Formal Assessments * Do Now * Exit Ticket * Surveys * Discussions * Debate   + Cloning Debate * Homework * Demonstrations * Simulations- Sri Lanka Elephants * Experiments/Lab Reports * STEAM Builds / Presentation   + “Build a Better Human Body”     Instructional Strategies:   * Survival of the Fittest Activities * Designer Babies PSA * Human Body Unit   + Basic Components (order of organization- cell to tissues to organ to organ systems to body systems) * Redesigning (Build) a Better Body 2.0 Project with Presentation/Physical Model   Interdisciplinary Connections   * Current Events * Writing Lab Reports/STEAM Reports * Mathematical Calculations     Technology Integration   * iPad * Google Classroom * Google Sites * Notability * Textbook * Video Clips * Simulations     Global Perspectives   * Nonfiction/Fiction Articles from around the Globe on Science Topics * Globally Current Events   + Articles on human longevity/enhancements   + Articles on Cloning/Stem Cell Research Debate * Science advancements made in the field of biology from other countries   Culturally Responsive Teaching   * Articles/ Textbook materials have the ability to allow the students to translate in their native language. * Acknowledging that each student comes from different backgrounds and culture; therefore, we will have discussions and surveys to bring the differences into the classroom |

NOTE re: Examples, Outcomes and Assessments

*The following skills and themes should be reflected in the design of units and lessons for this course or content area.*

21st Century Skills:

Creativity and Innovation

Critical Thinking and Problem Solving

Communication and Collaboration

Information Literacy

Media Literacy

Life and Career Skills

21st Century Themes (as applies to content

area):

Financial, Economic, Business, and

Entrepreneurial Literacy

Civic Literacy

Health Literacy