Science (Grade 8)

Course Description:

The curriculum for this required course is developed from the Next Generation Science Standards: http://www.nextgenscience.org/. The following practices are essential for all students to learn and be successful in science:

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

We use a variety of instructional strategies and provide students with the opportunity to develop the above skills while learning about the Scientific Method, Graphing, Environmental Science, Genetics and Evolution, Forces and Motion, and Astronomy. Additionally, we include Engineering/Design challenges that encourage students to problem solve and work collaboratively. The information in this course overview outlines what students should understand and be able to do by the end of the semester/year.

Mastery Standards:

MS-ETS1 Engineering Design

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-ETS1-1)

Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2)

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-ETS1-3)

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. (MS-ETS1-4)

MS-ESS3 Earth and Human Activity

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* (MS-ESS3-3)

Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. (MS-ESS3-2)

MS-ESS1 Earth's Place in the Universe

Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. (MS-ESS1-1)

Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. (MS-ESS1-2)

Analyze and interpret data to determine scale properties of objects in the solar system. (MS-ESS1-3)

MS-LS4 Biological Evolution: Unity and Diversity

Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. (MS-LS4-2)

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-LS4-4)

Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms. (MS-LS4-5)

Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. (MS-LS4-6)

MS-LS3 Heredity: Inheritance and Variation of Traits

Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. (MS-LS3-1)

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. (MS-LS3-2)

MS-LS2 Ecosystems: Interactions, Energy, and Dynamics

Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. (MS-LS2-1)

Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* (MS-LS2-5)

MS-PS2 Motion and Stability: Forces and Interactions

Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. (MS-PS2-4)

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-PS2-2)

Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.* (MS-PS2-1)

Unit	Description of Unit and Learning Targets
Unit One Title: Scientific Method and Data Interpretation Essential Questions: ● "How do we do science?"	Students will……. Learning Targets: ● Identify and describe each component of the scientific method. ● Describe when a graph is appropriate to use. ● Create and analyze various types of graphs. ● Describe the relationship between the independent variable and the dependent variable. ● Differentiate between various styles of graphs.

	● Differentiate between positive and inverse correlations. ● Compare and Contrast qualitative and quantitative data. ● Critique evidence and resources of quality.
Unit Two Title: Environmental Science Essential Questions: ● How do humans interact with the world around them?	Students will... Learning Targets: ● Describe the trend in human population over time and how it impacts resource availability. ● Differentiate between renewable and non-renewable resources. ● Provide examples of how humans have interacted with the land ● Provide examples of how humans have interacted with water resources ● Define climate change and cite evidence that supports it
Unit Three Title: DNA Essential Questions: ● What makes individuals of a species unique? ● Why is DNA necessary for life?	Students will... Learning Targets: ● Describe the structure and function of DNA. ● Describe the process of DNA Replication. ● Describe how a change in DNA can result in various mutations. ● Describe and analyze karyotypes.
Unit Four Title: Cell Division Essential Questions: ● What makes individuals of a species unique?	Students will... Learning Targets: ● Identify the three main components of the cell theory ● Define and describe the purpose of mitosis ● Identify and describes the steps of mitosis ● Define and describe the purpose of meiosis ● Identify and describe the steps of meiosis
Unit Five Title: Inheritance Patterns Essential Questions: ● What makes individuals of a species unique? ● How can you predict what an offspring will look like?	Students will... Learning Targets: ● Describe the research of Gregor Mendel and identify his four primary findings ● Differentiate between the three primary types of inheritance: complete, incomplete, and codominance. ● Complete a punnett square and solve problems concerning co-dominance inheritance. ● Complete a punnett square and solve problems concerning complete dominance inheritance. ● Complete a punnett square and solve problems concerning incomplete dominance inheritance.
Unit Six Title: Natural Selection and Evolution Essential Questions: ● What makes individuals of a species unique? ● What evidence supports life has changed over time? ● What relationships do living things share?	Students will... Learning Targets: ● Describe the impact of nature vs. nurture on an organism ● Provide evidence and examples of evolution as a long term process ● Explain how fossils, anatomical structures, and embryos support the theory of evolution ● Design and create an anatomical structure solution to a real-life organisms challenge/threat

Unit Seven Title: Newton's Laws of Motion Essential Questions: ● Why do objects move the way they do? ● How is gravity related to motion?	Students will... Learning Targets: ● Provide evidence and examples of Newton's first law of motion. ● Provide evidence and examples of Newton's second law of motion. ● Provide evidence and examples of Newton's third law of motion. ● Design a device that can demonstrate each of the three laws of motion.
Unit Eight Title: Astronomy Essential Questions: ● What is Earth's place in the universe? ● How does planetary motion relate to seasons? ● How is gravity related to motion?	Students will... Learning Targets: ● Address misconceptions about the reasons for the seasons and cite evidence to support the reasons we experience seasons. ● Identify the eight moon phases and describe why/how they occur ● Identify and describe solar and lunar eclipses ● Describe the forces of gravity and inertia ● Describe and develop a model to demonstrate how the forces of gravity and inertia work together to keep planets in motion