Science - Grade 8

Course Description:

The Indian Community School cultivates an enduring cultural identity and critical thinking by weaving indigenous teachings with a distinguished learning environment. The curriculum for this course is developed from the Next Generation Science Standards and the framework of the ICS Our Ways Cultural Calendar. In this course, students are part of a spiraling curriculum in which aspects of life science, physical science, earth/space science, and engineering/technology are addressed each school year. In grade eight, the life science topics include the study of life processes at both the cellular and multicellular levels and genetics. The physical science topics include the study of motion, energy, and waves. The earth/space science topic is Earth's place in the universe. Engineering design and human impact is covered in all aspects of the curriculum.

Enduring Understandings:

- Scientists can identify what makes up the solar system and universe and how the motion of objects in the universe can predict future phenomenon.
- The motion and behavior of objects can be quantified, explained, and predicted using scientific laws and principles in order to understand how forces interact with them.
- Energy comes in various forms, and its ability to be converted into different forms is essential for life's existence.
- Waves are a form of energy that move mechanically through matter or electromagnetically through space, producing such phenomena as light, sound, heat, and signals for communication.
- Scientists analyze and interpret data from many sources, including the fossil record, embryology, and anatomy, so that evolutionary relationships can be constructed.
- Scientists understand that the processes and technologies associated with inheritance allows scientists to explain and manipulate changes in populations and specific traits within populations over time.
- Scientists can predict how structural changes to genes (mutations) located on chromosomes may result in harmful, beneficial, or neutral effects to the structure and function of the organism, which is essential for understanding certain diseases and processes that may foster evolution.
- The engineering design process is used to design, evaluate, and analyze solutions to problems.
- Problem solving involves a safe, detailed, and orderly process, so that knowledge can be acquired, presented, and critiqued by doing experiments and investigations.
- Reading in the content areas requires interaction and interpretation of various discipline-specific texts in order to integrate and evaluate content, build knowledge, make meaning, construct evidence-based arguments, and select reliable and relevant resources for research.
- Writing in the content areas requires clear and coherent written products which are planned and developed with supporting evidence to demonstrate focused understanding of composition, written expression, and usage/mechanics in order to communicate a discipline-specific purpose to an appropriate audience.

PHYSICAL SCIENCE
• I can explain Newton's Third Law. (MS-PS-2-1) • I can develop a solution to a problem involving the motion of two colliding objects. (MS-PS-2-1) • I can plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object. (MS-PS2-2)

PHYSICAL SCIENCE (continued)

- I can plan an investigation to provide evidence that the change in an object's motion depends on the mass of the object. (MS-PS2-2)
- I can ask questions about data to determine the factors that affect the strength of electric forces. (MS-PS2-3)
- I can ask questions about data to determine the factors that affect the strength of magnetic forces. (MS-PS2-3)
- I can construct and present arguments using evidence to support the claim that gravitational interactions are always attractive. (MS-PS2-4)
- I can construct and present arguments using evidence to support the claim that gravitational interactions depend on the masses of interacting objects. (MS-PS2-4)
- I can conduct an investigation to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. (MS-PS2-5)
- I can evaluate an experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. (MS-PS2-5)
- I can use mathematical representations to describe a simple model for waves. (MS-PS4-1)
- I can explain how the amplitude of a wave is related to the energy in a wave. (MS-PS4-1)
- I can develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. (MS-PS4-2)
- I can 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-PS4-3)

LIFE SCIENCE

- I can use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors affect the probability of successful reproduction. (MS-LS1-4)
- I can use argument based on empirical evidence and scientific reasoning to support an explanation for how specialized plant structures affect the probability of successful reproduction. (MS-LS1-4)
- I can construct a scientific explanation based on evidence for how environmental factors influence the growth of organisms. (MS-LS1-5)
- I can construct a scientific explanation based on evidence for how genetic factors influence the growth of organisms.(MS-LS1-5)
- I can develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins. (MS-LS3-1)
- I can explain how mutations may result in harmful, beneficial, or neutral effects to the structure and function of the organism. (MS-LS3-1)
- I can develop and use a model to describe why asexual reproduction results in offspring with identical genetic information. (MS-LS3-2)

LIFE SCIENCE (continued)

- I can develop and use a model to describe why sexual reproduction results in offspring with genetic variation. (MS-LS3-2)
- I can analyze and interpret data for patterns in the fossil record that document the existence of life forms throughout the history of life on Earth. (MS-LS4-1)
- I can analyze and interpret data for patterns in the fossil record that document the diversity of life forms throughout the history of life on Earth. (MS-LS4-1)
- I can analyze and interpret data for patterns in the fossil record that document the extinction of life forms throughout the history of life on Earth. (MS-LS4-1)
- I can analyze and interpret data for patterns in the fossil record that document the evolution of life forms throughout the history of life on Earth. (MS-LS4-1)
- I can apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms. (MS-LS4-2)
- I can apply scientific ideas to construct an explanation for the anatomical similarities and differences between modern and fossil organisms to infer evolutionary relationships. (MS-LS4-2)
- I can analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. (MS-LS4-3)
- I can 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)
- I can gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms. (MS-LS4-5)
- I can use mathematical representations to support explanations of how natural selection may lead to increases of specific traits in populations over time. (MS-LS4-6)
- I can use mathematical representations to support explanations of how natural selection may lead to decreases of specific traits in populations over time. (MS-LS4-6)

EARTH AND SPACE SCIENCE

- I can develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases. (MS-ESS1-1)
- I can develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of eclipses of the sun and moon. (MS-ESS1-1)
- I can develop and use a model of the Earth-sun-moon system to describe the seasons. (MS-ESS1-1)
- I can develop and use a model to describe the role of gravity in the motions within galaxies. (MS-ESS1-2)
- I can develop and use a model to describe the role of gravity in the motions within the solar system. (MS-ESS1-2)
- I can analyze and interpret data to determine scale properties of objects in the solar system. (MS-ESS1-3)

ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE

- I can define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. (MS-ETS1-1)
- I can take into account relevant scientific principles and potential impacts on people that may limit possible solutions. (MS-ETS1-1)
- I can take into account relevant scientific principles and potential impacts the natural environment that may limit possible solutions. (MS-ETS1-1)
- I can evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS-ETS1-2)
- I can analyze data from tests to determine similarities and differences among several design solutions. (MS-ETS1-3)
- I can identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. (MS-ETS1-3)
- I can 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)