TREYNOR COMMUNITY SCHOOL DISTRICT
CURRICULUM FRAMEWORK

Subject: **Science**
Course: **Grade 7 Science**
Grade Level(s): **7**
Prerequisites: None

Course Description: In seventh-grade science, students engage in Science and Engineering Practices and apply Crosscutting Concepts to deepen their understanding of science. Core ideas included in 7th grade are Motion and Stability: Forces and Interactions, Energy, Earth's Place in the Universe, Organisms and Heredity, Ecosystems, and Engineering Design. The students will have multiple opportunities to demonstrate science learning, including, but not limited to, using models, providing evidence to support arguments, obtaining and analyzing data about relationships and interactions among observable components of different systems.

Examples of seventh graders' work in science include the following:

- 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.
- Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
- Plan an investigation to determine the relationships among energy transfer, type of matter, mass, and change in the energy of the particles as measured by the temperature.

Content Standards: In order that our students may achieve the maximum benefit from their talents and abilities, the seventh graders of the Treynor Community School who demonstrate understanding can . . .

I. Physical Science

1. Matter and Its Interactions

- 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.

2. **Motion and Stability: Forces and Interactions**
    - Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
    - 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.
    - Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
    - Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
    - 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.

3. **Energy**
    - 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.
    - 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.
    - Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
    - 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.
    - 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.

II. Life Science

1. **From Molecules to Organisms: Structures and Processes**
    - 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.
    - 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.
    - 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.

2. **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.
    - Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
    - Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
    - Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
    - Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

II. Earth and Space Science

- 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 season.
- Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
- Analyze and interpret data to determine scale properties of objects in the solar system.

III. Engineering, Technology, and Application of Science

1. **Engineering Design**
    - Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principals and potential impacts on people and the natural environment that may limit possible solution.
    - Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
    - 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 be better meet the criteria for success.
    - Develop a model to generate data for interactive testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.