Sparta Area School District

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Course Outcome Summary

Course Information: 8th Grade Physical Science

Description: Throughout the year students will have practice using the scientific method steps: formulating a clear question, making a hypothesis, designing an experiment, recording observations, and forming conclusions. Additionally, students will practice creating and interpreting graphs and analyzing and evaluating scientists' opinions and results. Content used as a framework includes physics topics of motions, forces, and energy.

This course is about: Scientific reasoning, interpreting data, and understanding science in the physical world.

Instruction Level: 8th Grade differentiated

Prerequisites: 7th Grade Life Science

Course Standards: ACT College and Career Readiness Standards

IOD = *Interpretation of Data*

SIN = *Scientific Investigation*

EMI = *Evaluation of Models, Inferences and Experimental Results*

Lower

- Find basic information in text that describes a simple data presentation
- Find basic information in text that describes a simple experiment
- Understand the tools and functions of tools used in a simple experiment
- Find basic information in a model

Middle

- Understand the tools and functions of tools used in a complex experiment
- Find basic information in text that describes a complex experiment
- Determine how the values of variables change as the value of another variable changes in a simple data presentation
- Understand the methods used in a simple experiment
- Understand the tools and functions of tools used in a complex experiment
- Find basic information in text that describes a complex experiment
- Identify implications in a model
- Determine which models present certain basic information

Honors

- Determine which simple hypothesis, prediction, or conclusion is, or is not, consistent with a data presentation, model, or piece of information in text
- Identify key assumptions in a model
- Determine which models imply certain information
- Understand a simple experimental design
- Understand the methods used in a complex experiment
- Identify a control in an experiment
- Determine which simple hypothesis, prediction, or conclusion is, or is not, consistent with a data presentation, model, or piece of information in text

Units

1. **Scientific Method**
2. **Interpreting Graphs**
3. **Physics, Energy & Motion**
4. **Space & Matter**
5. **Weather, Climate & Environmental Science**

Unit Outlines

1. **Unit 1: The Scientific Method & Graphing**
   - This unit focuses on the using the scientific process of inquiry: formulating a clear question, making a hypothesis, designing an experiment, recording observations, and forming conclusions. Students will also read, create, and interpret various graphs.

Essential Question:

Students will be able to answer the question(s):

- How do we use scientific investigations to find answers to questions?
- Why do we use variables in an experiment?
- How do we use data show correlations?

Essential Knowledge:

What are the key concepts/vocabulary/ideas that students will have mastery of by the completion of the unit?

Students will be able to:

a) Identify the independent and dependent variables in an experiment
b) Apply the scientific method to a particular problem
c) Write a summary and lab report using the MEL-Con format
d) Design and carry out a controlled experiment
e) Construct data tables and graphs
f) Interpret and analyze different types of graphs
g) Formulate a testable hypothesis

Key vocabulary: hypothesis, independent variable, dependent variable, inquiry, stereotypes, conclusion, quantitative data, qualitative data, inference, operation, bias, control group, experimental group

2. Unit 2: Physics, Energy, & Motion

- This unit examines the laws and forces of physics and how they relate to roller coasters. We will design and construct a roller coaster using the engineering design process while applying the laws of physics.

Essential Question:

Students will be able to answer the question(s):

- How do roller coasters work, and how does this apply to physics?
- What is the engineering design process? How do engineers solve problems?
- How do you use the engineering design process to design and create a roller coaster that fits within budget and design specifications?

Essential Knowledge:

What are the key concepts/vocabulary/ideas that students will have mastery of by the completion of the unit?

Students will be able to:

a) Identify and predict how the direction or speed of an object may change due to an outside force
b) Analyze and interpret observable data about the impact of forces on the motion of objects
c) Measure the change in speed or direction of an object using appropriate units
d) 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
e) 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
f) Collaboratively design a roller coaster model, identifying points of kinetic & potential energy, friction, positive and negative G-forces

Key vocabulary: centripetal force, gravity, G-force, Newton's Laws, inertia, potential energy, kinetic energy, speed, velocity, mass, friction, acceleration

3. Unit 3: Space & Matter

- This unit examines current space efforts to build a sustainable colony on Mars. We will investigate why we are considering building a community on Mars, compare and contrast similarities between Earth and Mars, and explore various aspects of space travel, matter, and celestial objects.

Essential Question:

Students will be able to answer the question(s):

- How could we survive on Mars?
- Why is the United States interested in creating a community on Mars?
- What is a design for, and what are the criteria and constraints of a successful solution?
- What is the process for developing potential design solutions?

Essential Knowledge:

What are the key concepts/vocabulary/ideas that students will have mastery of by the completion of the unit?

Students will be able to:

a) Build an initial model of a sustainable community that meets criteria and constraints
b) Explain what are the predictable patterns caused by Earth's movement in the Solar System
c) Categorize environmental data
d) Test a rocket model and predict its motion
e) Produce a concept for an investigation that requires science questions, engineering and technological solutions, and teamwork
f) Model a technological design solution (mission) within the constraints and limitations of the problem
g) Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system
h) Describe what matter is and explain the connection between matter and radiation
i) Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes

Key vocabulary: atmosphere, radiation, rover, lander, satellite, International Space Station, orbit, polar ice caps, atmospheric pressure, sustainable, gravity, diameter, axis, circumference

4. Unit 4: Weather, Climate & Environmental Science

- This unit examines weather, climate, and the behavior of the atmosphere, such as: wind, temperature, humidity, air pressure, and precipitation at any given point on a planet's surface at a given time. This unit also focuses on environmental science and the study of the relationships of the natural world and the relationships between people and their environments.

Essential Question:

Students will be able to answer the question(s):

- In what ways do humans depend upon natural systems?
- How are human and natural systems interrelated?
- What makes a system balanced? What happens in a system when it is out of balance?
- How do we decide what to believe about a scientific claim?

Essential Knowledge:

What are the key concepts/vocabulary/ideas that students will have mastery of by the completion of the unit?

Students will be able to:

a) Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
b) 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
c) Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
d) Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
e) Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems
f) Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Key vocabulary: air mass, atmosphere, atmospheric pressure, weather, climate, evaporation, cold front, dew point, precipitation, wind, water vapor, energy efficiency, natural resources, natural disasters, pesticides, pollution, ozone, hazardous waste, sustainability