Course Description:

The first three modules of Semester 1 cover Scientific Inquiry, the Structure and Composition of the Universe, and the Features of the Solar System. Students learn the importance of scientific inquiry and how to communicate the results of scientific investigations. They then have material on the formation of the universe, including the Big Bang Theory, the motions of celestial objects, and stellar evolution. The third module covers material related to the Solar System, including features of the Sun and the planets and the movements of Earth. The second three modules of Semester 1 cover Weather, Climate, and Earth's Water Cycle. Students first learn in Module 4 about the atmosphere and clouds, as well as the factors that influence local and global climate. In Module 5 they continue by learning about weather and air masses, meteorology and storms. Module 6 then discusses the water cycle, including groundwater and ocean features, as well as water scarcity and pollution.

Materials Needed:

- uninflated round balloon
- permanent marker
- 50 small candies that have letters on one side of them (like M&Ms or Skittles)
- a small zipper seal plastic bag
- two kitchen mixing bowls
- ice cubes
- water
- a permanent marker
- a block of wood
- a pair of pliers
- a pair of needle-nose tweezers
- a slotted spoon
- a drinking straw
- sunflower seeds in the shell
- colored water
- a long narrow vase
- rice grains
- small block of Styrofoam
- 3 or 4 large marshmallows
- a teaspoon of herbs (any kind will do, like basil or parsley)

Module	Lesson Title	Objectives
Introduction	Scientific Inquiry	• Generate and evaluate questions that can be answered through scientific inquiry.

Module	Lesson Title	Objectives
		• Critique the questions generated by others.
	Models	• Describe the types of models that scientists use. • Describe how a theory or conceptual model can generate a testable hypothesis. • Formulate one or more hypotheses based on a model.
	Scientific Questions	• Describe the methods used to answer various kinds of research questions. • Plan and conduct a scientific investigation, choosing a method appropriate to the question being asked. • Evaluate an investigation, determining if it was a valid means of answering the questions.
	Scientific Data	• Collect data. • Draw conclusions supported by scientific evidence.
	Scientific Theory	• Define theory and explain how a theory is developed. • Explain the roles of logical reasoning, creativity, testing, revision, and occasional discarding of theories in scientific endeavors.
	Scientific Communication	• Describe the role of communication in scientific endeavors. • Explain the need for intellectual honesty in scientific investigations.

Module	Lesson Title	Objectives
		• Participate in scientific discussions about an investigation.
	Scientific Reporting	• Demonstrate how to create and interpret scientific tables and graphs. • Demonstrate how to properly cite references in a scientific report.
	Science and Society	• Describe how citizens can use science to be informed about critical issues that affect society. • Describe ways that scientific ideas have influenced society or the development of different cultures. • List questions that scientists generate that are stimulated by the needs of society.
	Introduction Module Exam	
The Universe	The Force of Gravity	• Identify the variables that affect the strength of the force of gravity. • Predict how motion would change if gravity were stronger or weaker. • Explain how gravity affects the orbits of celestial objects
	The Formation of the Universe	• Describe when and how scientists believe the universe was formed. • Describe the Big Bang Theory. • Cite evidence for the Big Bang Theory.

Module	Lesson Title	Objectives
	The Structure of the Universe	• Describe and illustrate the structure of the universe, including stars, nebula, galaxies, and planetary systems.
	How Stars Transform Matter Into Energy	• Connect stars to the production of elements through the process of nuclear fusion.
	Stellar Evolution	• Describe the methods we use to study stars. • Diagram the life cycle of a star. • Explain the characteristics of stars at various stages of evolution.
	Diagramming the Life Cycle of Stars	• Interpret H-R diagrams to determine information about a star's life cycle.
	The Universe Module Exam	
Earth's Place in the Universe	Formation of the Solar System	• Explain the forces and actions responsible for formation of the solar system. • Describe how scientists estimate the age of the solar system. • Illustrate the structure of the solar system.
	The Sun	• Illustrate the six layers of the sun. • Explain how the sun is powered by the nuclear fusion process. • Describe sun spots, flares, prominences, and solar wind.

Module	Lesson Title	Objectives
	The Planets	• Describe the characteristics of the terrestrial planets. • Describe the characteristics of the gas giant planets.
	Orbits of the Planets	• Explain the forces that define planetary orbits and how they work. • Explain what is meant by an elliptical orbit. • Describe a planet's aphelion and perihelion.
	The Movement of the Earth	• Describe the movements of the Earth in relation to the Solar System, the Milky Way Galaxy, and the Local Group of galaxies.
	Eclipses	• Distinguish between the various shadows of the Sun and Moon. • Observe the different types of eclipses. • Identify differences between solar and lunar eclipses.
	Asteroids, Meteors, and Comets	• Explain the structure and composition of the asteroids, meteors and comets. • Explain where asteroids, meteors, and comets originate. • Describe the orbits of asteroids, meteors and comets.

Module	Lesson Title	Objectives
	Dwarf Planets	• Define dwarf planet, stating how a dwarf planet differs from the planets. • Describe the defining characteristics of a dwarf planet. • Describe the area of the solar system known as the Kuiper Belt.
	Earth's Place in the Universe Module Exam	
Earth's Atmosphere and Climates	Composition of the Atmosphere	• Specify the composition of the atmosphere near the earth's surface. • Describe the layers of Earth's atmosphere.
	Air and Humidity	• Define dew-point and relative humidity and explain the relationship between them. • Calculate the Relative and Specific humidity of atmospheric air. • Describe the relationship between specific humidity and relative humidity.
	Clouds	• Identify the three layers of clouds and a sample cloud in each layer. • Describe how clouds are formed. • Describe how clouds can be used to predict the weather.
	Climate Patterns	• Explain how global climate differences are due to uneven heating of the Earth's surface by the sun. • Describe how climate is determined by energy transfer from the sun the factors that affect this.

Module	Lesson Title	Objectives
		• Explain how seasonal climate variations are due to the tilt of the Earth's axis.
	Earth's Atmosphere and Climates Module Exam	
Weather	Air Pressure	• Explain how atmospheric pressure originates. • Explain tools used to measure air pressure and the units of measurement that describe it. • Explain the effects of altitude, temperature, and humidity on air pressure.
	Wind	• Explain the relationship between air pressure and global winds • Predict the direction of wind flow across the Earth's surface in response to pressure gradient, Coriolis Effect and also frictional
	Weather and Air Masses	• Explain the relationship between air masses and weather. • Knowledge of how warm fronts and cold fronts interact with air masses. • Know what types of clouds and weather cold fronts cause and warm fronts cause.

Module	Lesson Title	Objectives
	Meteorology	• Describe methods of weather forecasting. • Describe the basic instruments used at weather stations and what they are used for. • Describe the process of collecting weather data, recording and analyzing data, making short- and long-term. • Forecast and the importance of weather observations.
	Storms	• Describe the formation of thunderstorms and tornadoes • Explain how a hurricane forms • Describe the role of scientists in helping society predict and prepare for storm hazards.
	Weather Module Exam	
Water	The Water Cycle	• Describe the distribution of Earth's fresh water and explain implications of this. • Describe how the water cycle functions as a process. • Explain the factors that generate surface runoff. • Describe connections between water cycle processes, e.g., runoff and surface water, or infiltration and groundwater storage, etc.

Module	Lesson Title	Objectives
	Groundwater	• Define groundwater and describe where it is found and how it is used. • Define aquifer, confined aquifer, and water table. • Illustrate how an artesian well flows. • Describe environmental consequences of groundwater overuse.
	Oceans	• Illustrate the locations of the world's oceans. • Describe the role of the oceans in Earth's climate. • Describe the work of oceanographers.
	Ocean Features	• Recognize and describe the following features of the ocean: Mid-ocean ridge, Ocean floor, Continental shelf, Continental rise, Continental slope.
	Ocean Currents	• Describe the forces that create the ocean conveyor belt. • Describe how the Coriolis Effect acts on winds and ocean currents. • Explain how salinity and temperature affect ocean water density. • Explain the cause of ocean gyres. • Explain how wavelength and wave height are measured.
	Water Scarcity and Pollution	• Explain natural and anthropogenic causes of water pollution. • Make connections between human activity and water pollution.

Module	Lesson Title	Objectives
		• Define water scarcity and describe solutions to water scarcity. • Explain measures to prevent and clean up water pollution.
	Water Module Exam	
Semester Exam		