

Course Description:

Grade 5 Science continues to build on the science skills that have been obtained in years prior. There will be an emphasis on earth and space science, life science, and physical science. Students will begin the course by focusing on earth and space science by looking at the solar system and planets. Students will come to an understanding of the concept of the earth as a sphere and the earth's place in the solar system. The course continues with a focus on physical science and the different tools that can measure force, time, and distance. They will also grow in their understanding of how light and sound travel and interact with each other as well as the different types of energy. The semester concludes with a look into life science and the ways that organisms are interconnected. Instruction will include real life application, hands-on projects and assessments, and video and short research projects.

Materials Needed:

- Three types of seeds: corn (maize), bean (lima or other large bean), and radish
- 8.5"x 11" piece of cardstock or light cardboard
- Ziploc or plastic lunch bag
- Paper towel
- Masking tape
- Water
- 2 to 4 weeks of experiment time
- Optional magnifying glass
- Balloons
- Pencil
- Tape measure
- Clothespin
- Graph paper
- Flashlight
- Colored pencils
- Wine glass (with rim is best)

Module	Lesson Title	Objectives
1	Intro to Solar System	<ul style="list-style-type: none"> Describe the solar system as a system of planets, dwarf planets, and other celestial bodies.
	The Solar System	<ul style="list-style-type: none"> Describe the sun and its attributes. Diagram the planets in our solar system. Distinguish between the Jovian and terrestrial planets.
	Dwarf Planets	<ul style="list-style-type: none"> Describe the Jovian planets. Describe the dwarf planets.
	Asteroids, Meteoroids, and Comets	<ul style="list-style-type: none"> Describe and distinguish among asteroids, meteoroids, and comets.
	Planet Orbits and Gravity	<ul style="list-style-type: none"> Define gravitational force. Define orbit.
	Mercury, Venus, and the Formation of the Solar System	<ul style="list-style-type: none"> Describe Mercury and Venus, and describe the differences between them and Earth. Define nebulae.
	Earth, Mars, Jupiter and Saturn	<ul style="list-style-type: none"> Describe the unique characteristics of Earth, Mars, Jupiter, and Saturn, including each planet's size, composition, orbit, and distance from the sun. Identify which planets have moons and/or debris that orbit them.
	Uranus, Neptune and Dwarf Planets	<ul style="list-style-type: none"> Describe the unique characteristics of Uranus, Neptune, and the larger dwarf planets, including each planet's size, composition, orbit, and distance from the sun. Describe the moons and/or debris that orbit Uranus, Neptune, and the dwarf planets.

	Gravity and Orbits	<ul style="list-style-type: none"> ● Identify and describe the similarities and differences between comets, asteroids, and meteoroids. ● Describe why comets, asteroids, and meteoroids orbit the sun. ● Explain the effect of gravity on a planet's orbit around the sun.
	Comets	<ul style="list-style-type: none"> ● Describe the parts of a comet and why it shines so brightly in the night sky. ● Describe the orbit of a comet around the sun.
	Asteroids	<ul style="list-style-type: none"> ● Describe an asteroid and its composition. ● Describe an asteroid collision.
	Meteoroids	<ul style="list-style-type: none"> ● Distinguish between meteoroids, meteors, and meteorites. ● Identify and describe the similarities and differences between comets, asteroids, and meteoroids.
2	The Big Bang	<ul style="list-style-type: none"> ● Describe the events that occurred during and after the Big Bang.
	Birth of Stars	<ul style="list-style-type: none"> ● Explain how stars are born.
	Life Cycle of Stars	<ul style="list-style-type: none"> ● Explain how stars are born. ● Describe how stars are classified.
	Life & Death of Stars	<ul style="list-style-type: none"> ● Describe how stars are classified. ● Explain the life cycle and death of different types of stars.
	Intro to the Sun	<ul style="list-style-type: none"> ● Describe the basic structure of the sun.
	Structure of the Sun	<ul style="list-style-type: none"> ● Describe the sun's components. ● Explain the difference between apparent brightness and absolute brightness.

	Rotation and Revolution	<ul style="list-style-type: none"> Describe that cycles and patterns of motion between the Earth and the sun are predictable. Recognize that Earth's revolution around the sun takes approximately 365 days.
	Seasons	<ul style="list-style-type: none"> Explain how the cycles and patterns of motion between Earth and the sun are predictable. Recognize that Earth's tilt on its axis causes the seasons.
3	Earth's Tilt and the Seasons	<ul style="list-style-type: none"> Know that Earth's revolution around the sun takes approximately 365 days. Describe how Earth's axis is tilted at an angle of 23.5° Explain how Earth's tilt is the cause of Earth's seasons.
	Spring	<ul style="list-style-type: none"> Explain how Earth's tilt is the cause of spring. Describe the characteristics of spring.
	Summer	<ul style="list-style-type: none"> Explain how Earth's tilt is the cause of summer. Explain the term summer solstice.
	Autumn	<ul style="list-style-type: none"> Describe the changes that come with the season, Autumn. Explain how Earth's tilt is the cause of autumn.
	Intro to the Moon	<ul style="list-style-type: none"> Identify Earth as having a single moon that revolves around, or orbits, the Earth.
	Night and Day	<ul style="list-style-type: none"> Explain how the relationship between Earth and the moon creates day and night and the phases of the moon. Describe how Earth's rotation on its axis in a 24-hour period produces day and night.
	Phases of the Moon	<ul style="list-style-type: none"> Explain how the relationship between Earth and the moon creates day and night and the phases of the moon.
	Tides	<ul style="list-style-type: none"> Understand how the moon helps create the tides in Earth's oceans.

	Living on Planet Earth	<ul style="list-style-type: none"> ● List and define common terms used to describe Earth. ● Explain and identify the four systems that support life on Earth. ● Describe at least five reasons that life can exist on Earth. ● Explain specific ways in which the hydrosphere, geosphere, atmosphere, and biosphere interact on Earth.
	Freshwater on Earth	<ul style="list-style-type: none"> ● Describe the role freshwater plays in supporting life on Earth. ● Explain the different states and phase changes of water. ● Relate water states and phase changes to the water cycle. ● Explain the water cycle through the processes of evaporation, condensation, and precipitation.
	Position, Motion and Force	<ul style="list-style-type: none"> ● Explain the relationship between position, motion, and force.
	Measuring Speed	<ul style="list-style-type: none"> ● Understand that movement can be measured by speed. ● Explain how the speed of an object is calculated by determining the distance (d) traveled in a period of time (t).
4	Gravity, Mass and Weight	<ul style="list-style-type: none"> ● Explain why Earth pulls all objects “down” (towards Earth’s center). ● Explain that weight represents the amount of gravitational force between an object and the Earth. ● Give an example of how gravity can affect the speed of an object.
	Earth and Weight	<ul style="list-style-type: none"> ● Explain why Earth pulls all objects “down” (towards Earth’s center). ● Explain that weight represents the amount of gravitational force between an object and the Earth. ● Give an example of how gravity can affect the speed of an object.

	Forces, Motion, and Speed	<ul style="list-style-type: none"> ● Describe the relationship between pushes and pulls (forces) and a change in an object's motion, including that greater force on an object leads to greater change in motion. ● Give an example of how gravity can affect the speed of an object.
	Force	<ul style="list-style-type: none"> ● Explain that a force is a push or a pull on an object. ● Explain that applying a force to an object can change the object's movement. ● Explain that the amount of change in movement of an object is based on the weight of the object and the amount of force exerted.
	Motion and Forces	<ul style="list-style-type: none"> ● Explain that a force is a push or a pull on an object. ● Recognize that applying a force to an object can change the object's movement. ● Explain a normal force and its relationship to gravity.
	Laws of Motion	<ul style="list-style-type: none"> ● Use Newton's Laws of Motion to describe the motion of objects.
	Acceleration	<ul style="list-style-type: none"> ● Understand that the weight of the object and amount of force applied affect the speed of the object. ● Explain that acceleration is a rate of change in velocity.
	Building Blocks	<ul style="list-style-type: none"> ● Be able to identify the three parts of an atom. ● Be able to explain what makes atoms different from one another. ● Be able to identify a variety of elements. ● Understand how to read the periodic table given a chemical symbol and the atomic number of an element. ● Be able to explain how molecules and compounds are similar and different.
	Properties of Matter	<ul style="list-style-type: none"> ● Understand that everything is matter. ● Understand that matter is made up of atoms.

		<ul style="list-style-type: none"> ● Explain the different states of matter. ● Explain what a phase change is and how it occurs. ● Identify physical and chemical changes of matter.
	Conservation of Mass	<ul style="list-style-type: none"> ● Explain the law of conservation of mass. ● Understand that no matter the change in state of a substance, the total weight of matter is conserved. ● Understand that the mass of reactants in a chemical reaction should be conserved and equal the mass of the products.
	Mixtures and Compounds	<ul style="list-style-type: none"> ● Be able to explain the difference between a mixture and a compound. ● Understand what makes a mixture homogeneous or heterogeneous. ● Be able to identify the difference between a homogeneous and heterogeneous mixture. ● Understand the difference and similarities between an element and a compound.
5	Light and Color	<ul style="list-style-type: none"> ● Describe how light travels as waves. ● Explain that as light travels from one place to another, it goes in a straight line until it interacts with another object or material. ● Describe how shadows are formed. ● Explain how colors are produced when white light is separated into different wavelengths.
	Refraction of Light	<ul style="list-style-type: none"> ● Explain what happens when light is refracted or bent.
	Reflection of Light	<ul style="list-style-type: none"> ● Explain what it means when light is being bounced back or reflected. ● Explain how colors are perceived as a reflection of light that is separated into different wavelengths.
	Intro to Sound	<ul style="list-style-type: none"> ● Describe how sound is produced by vibrating objects.

	Pitch and Loudness	<ul style="list-style-type: none"> ● Explain how the rate of vibration is related to the pitch of the sound. ● Describe how the loudness of sound is measured.
	Traveling Sound	<ul style="list-style-type: none"> ● Explain what it means that sound requires a medium through which to travel. ● Describe how sound travels at different speeds in different mediums.
	Sound Part 1	<ul style="list-style-type: none"> ● Explain how sound is a form of energy. ● Recognize that sound travels as waves and can be measured. ● Describe how sound waves behave in predictable ways, such as being reflected or refracted.
	Sound Part 2	<ul style="list-style-type: none"> ● Recognize that sound travels as waves through a medium. ● Describe how sound waves behave in predictable ways, such as being reflected or refracted.
	Light Part 1	<ul style="list-style-type: none"> ● Explain how light is a form of energy. ● Recognize that light travels as waves and can be measured.
	Light Part 2	<ul style="list-style-type: none"> ● Describe how light waves behave in predictable ways, such as being reflected or refracted.
6	Nonrenewable Resources	<ul style="list-style-type: none"> ● Describe the difference between renewable and nonrenewable energy sources. ● Explain why nonrenewable energy sources are important to humans.
	Renewable Resources	<ul style="list-style-type: none"> ● Discuss the role that energy sources play in food chains. ● Explain why it is important to protect energy relationships in food chains.
	Flow of Energy	<ul style="list-style-type: none"> ● Recognize that energy from the sun provides the energy to sustain almost all life on Earth. ● Describe why photosynthesis is so important to living things. ● Explain how energy flows through a food chain.

	Phytoplankton	<ul style="list-style-type: none"> ● Explain how energy flows through a food chain using the example of plankton in the ocean.
	Energy Consumers	<ul style="list-style-type: none"> ● Describe how populations of organisms can be categorized by how they acquire energy. ● Explain the difference between a producer and a consumer in a food chain. ● Identify organisms as energy consumers, including identifying the organism as a primary or other-level consumer. ● Describe the variety of ways in which consumers are able to get food.
	Ecosystem	<ul style="list-style-type: none"> ● Explain how all of the processes that take place within organisms require energy. ● Identify how populations of organisms can be categorized by how they acquire energy. ● Describe how, for ecosystems, the major source of energy is sunlight.
	Food Chains and Food Webs	<ul style="list-style-type: none"> ● Identify how populations of organisms can be categorized by how they acquire energy. ● Explain how food chains and food webs can be used to identify the relationships among producers, consumers, and decomposers in an ecosystem. ● Use a model to describe that energy in animals' food was once energy from the sun.
	Extreme Organisms	<ul style="list-style-type: none"> ● Describe the interrelationship between organisms that are necessary for survival. ● Explain how organisms live in extreme environments.

Course Description:

Semester B puts great emphasis on life science and begins by focusing on the many ecosystems of the earth and the way that all parts of ecosystems depend on each other. Students will learn the different types of ecosystems that exist. They will learn that ecosystems change and how the changes affect their ability to support their populations. Learners will examine plants; that they have different structures and how those structures allow them to respond to different needs. Students will also grow in their understanding of the importance of good nutrition to all living organisms. The course concludes with a look into the scientific process and the importance of investigations and conclusions in the study of science. Instruction will include real life application, hands-on projects and assessments, and video and short research projects.

Materials Needed:

- Three types of seeds: corn (maize), bean (lima or other large bean), and radish
- 8.5"x 11" piece of cardstock or light cardboard
- Ziploc or plastic lunch bag
- Paper towel
- Masking Tape
- Water
- 2 to 4 weeks of experiment time
- Optional Magnifying glass

Module	Lesson Title	Objectives
1	Ecosystem	<ul style="list-style-type: none"> Describe or illustrate what an ecosystem is Identify and describe the major characteristics of different types of ecosystems.
	Ethiopian Highlands	<ul style="list-style-type: none"> Describe the how the mountains in Ethiopia were formed. Identify the primary consumers in the Ethiopian Highlands.
	Andes and Rockies Ecosystems	<ul style="list-style-type: none"> Describe how organisms perform a variety of roles in an ecosystem. Illustrate how energy entering ecosystems as sunlight is transferred and transformed by producers into energy that organisms use through the process of photosynthesis. Identify producers and consumers in mountain ecosystems.
	The Himalayas Ecosystem	<ul style="list-style-type: none"> Describe how organisms perform a variety of roles in the Himalayas. Identify and compare the wild goats found in mountain ecosystems.
	Ecosystem Review	<ul style="list-style-type: none"> Describe or illustrate what an ecosystem is. Describe how organisms perform a variety of roles in an ecosystem.
	Tundra Plants	<ul style="list-style-type: none"> Identify and describe the different types of tundra ecosystems. Identify and describe the plants and animals of the tundra.
	Tundra Animals	<ul style="list-style-type: none"> Describe how organisms perform a variety of roles in an ecosystem. Identify producers and consumers in the tundra ecosystem.
	Arctic Tundra Ecosystem	<ul style="list-style-type: none"> Describe how organisms perform a variety of roles in an ecosystem. Identify producers and consumers in the tundra ecosystem.
	Forest Ecosystem	<ul style="list-style-type: none"> Describe or illustrate what an ecosystem is.

		<ul style="list-style-type: none"> Describe or illustrate how energy entering ecosystems as sunlight is transferred and transformed by producers, through the process of photosynthesis, into energy that organisms use. Identify producers and consumers in a forest ecosystem. Describe how organisms perform a variety of roles in an ecosystem.
	Taiga	<ul style="list-style-type: none"> Describe how organisms perform a variety of roles in an ecosystem. Identify the primary producers and consumers in the Tiaga forest.
	Temperate Coniferous Forest	<ul style="list-style-type: none"> Identify producers and consumers in a forest ecosystem.
	Temperate Broadleaf Forest	<ul style="list-style-type: none"> Identify producers and consumers in a forest ecosystem.
	Forest Ecosystem	<ul style="list-style-type: none"> Describe or illustrate what an ecosystem is. Describe or illustrate how energy entering ecosystems as sunlight is transferred and transformed by producers, through the process of photosynthesis, into energy that organisms use. Identify producers and consumers in a forest ecosystem. Describe how organisms perform a variety of roles in an ecosystem.
2	Ecosystem: Energy Flow	<ul style="list-style-type: none"> Describe or illustrate what an ecosystem is.
	The Rainforest Ecosystem	<ul style="list-style-type: none"> Describe how organisms perform a variety of roles in an ecosystem. Describe or illustrate how energy entering ecosystems as sunlight is transferred and transformed by producers, through the process of photosynthesis, into energy that organisms use. Identify producers and consumers in a tropical rainforest ecosystem.
	Ecosystems: Tropical Rainforest	<ul style="list-style-type: none"> Describe or illustrate what an ecosystem is. Describe how organisms perform a variety of roles in an ecosystem.

		<ul style="list-style-type: none"> Identify producers and consumers in a tropical rainforest ecosystem.
	Energy flow in Marine Life	<ul style="list-style-type: none"> Describe or illustrate what an ecosystem is. Describe the flow of energy through a marine ecosystem.
	Marine Ecosystem	<ul style="list-style-type: none"> Describe or illustrate what an ecosystem is. Describe how organisms perform a variety of roles in an ecosystem. Describe how energy entering ecosystems as sunlight is transferred and transformed by producers, through the process of photosynthesis, into energy that organisms use. Identify producers and consumers in a marine ecosystem.
	North Atlantic and Coral Reef	<ul style="list-style-type: none"> Describe or illustrate what an ecosystem is. Describe how organisms perform a variety of roles in an ecosystem. Describe how energy entering ecosystems as sunlight is transferred and transformed by producers, through the process of photosynthesis, into energy that organisms use. Identify producers and consumers in a marine ecosystem.
	Grassland and Savanna	<ul style="list-style-type: none"> Describe or illustrate what an ecosystem is. Describe how organisms perform a variety of roles in an ecosystem. Describe how energy entering ecosystems as sunlight is transferred and transformed by producers, through the process of photosynthesis, into energy that organisms use. Identify producers and consumers in a grassland ecosystem.
	Tallgrass Prairie	<ul style="list-style-type: none"> Describe or illustrate what an ecosystem is. Describe how organisms perform a variety of roles in an ecosystem. Describe how energy entering ecosystems as sunlight is transferred and transformed by producers, through the process of photosynthesis, into energy that organisms use. Identify producers and consumers in a prairie grassland ecosystem.
3	Plants: Stems and Transportation	<ul style="list-style-type: none"> Describe the difference between herbaceous and woody plants, and the function of stems and wood. Describe the transportation of water and nutrients through specialized plant tissues.

		<ul style="list-style-type: none"> Identify the function of roots and leaves.
	Photosynthesis	<ul style="list-style-type: none"> Describe in appropriate detail the process of photosynthesis and write a scientific equation that represents the process. Identify and describe the parts of a leaf involved in photosynthesis. Explain what transpiration is, and how it works.
	Green Algae and Bryophytes	<ul style="list-style-type: none"> Distinguish between four different plant groups green algae bryophytes (mosses) ferns and fern allies seed plants (including gymnosperms and angiosperms).
	Ferns, Conifers and Flowering Plants	<ul style="list-style-type: none"> Distinguish between four different plant groups green algae bryophytes (mosses) ferns and fern allies seed plants (including gymnosperms and angiosperms) Describe and define the main parts of a flower. Describe how flowers reproduce through pollination.
4	Nutrition	<ul style="list-style-type: none"> Define the basic terms used in learning about nutrition. Explain how our bodies use food for energy and nutrition. Understand how vitamins and minerals are used in our bodies. List a variety of foods that provide specific vitamins and minerals. Identify specific vitamins and minerals, their food sources, and their health benefits.
	Proteins and Amino Acids	<ul style="list-style-type: none"> Explain how proteins, amino acids, and fiber are used in our bodies for growth and nutrition.
	Proteins, Amino Acids and Fiber Review	<ul style="list-style-type: none"> List a variety of foods that provide proteins, amino acids, or fiber. Identify types of proteins, amino acids, and fibers, their food sources, and their health benefits.
	Seeds	<ul style="list-style-type: none"> List the basic requirements for seed germination and growth. Describe several methods of seed dispersal common in nature.

5	Roots	<ul style="list-style-type: none"> Identify the parts of a seedling. Identify the function and purpose of the plant's roots.
	Stems	<ul style="list-style-type: none"> Identify the function and purpose of the plant's stem.
	Leaves	<ul style="list-style-type: none"> Identify the function and purpose of the plant's leaves.
	Nutrients	<ul style="list-style-type: none"> Describe the nutrients that make up rich soil.
	Soil Life	<ul style="list-style-type: none"> Identify the organisms that comprise rich soil.
	Fertilizer	<ul style="list-style-type: none"> Distinguish between humus and compost and describe the purpose of a fertilizer.
	Soil System	<ul style="list-style-type: none"> Describe a healthy soil system and its layers.
	Plants Sense and Respond	<ul style="list-style-type: none"> Explain why plants turn their stems or leaves towards the light (phototropism). Explain why roots grow down into the soil and stems grow up even when there is no light (gravitropism). Explain why some vines and other climbing plants respond to touch (thigmotropism). Consider whether hydrotropism is separate from gravitropism.
6	Cell Division	<ul style="list-style-type: none"> Explain and describe the basics of cell division. Describe and define the basics of asexual reproduction in plants and simple organisms. Define and describe the basics of sexual reproduction in some plants and in most animals.
	The Scientific Process	<ul style="list-style-type: none"> Define science, and describe why it is important. List the steps in the scientific method. Design and carry out a simple experiment.

	Investigations and Conclusions	<ul style="list-style-type: none">• Understand the steps in the scientific method.• Identify questions that can be answered through scientific investigations.• Practice the scientific method.• Design and conduct a scientific investigation.• Communicate scientific conclusions and explanations.
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