San Juan del Sur Day School

Grade 6 Science Learning Outcomes and Unit Guide

Unit	Learning Outcomes	✓	Performance Indicators
Who We Are	**Earth & Space Science: Geology (G)**		
	Investigate the characteristics and formation of the surface geology of Nicaragua, including soil, and identify correlations between surface geology and past, present, and possible future land uses.		Model the processes of formation of the three major types of rocks: sedimentary, igneous, and metamorphic.
			Explain how geologists use the fossil record to provide evidence of geological history.
			Construct a visual representation of the rock cycle (e.g., formation, weathering, sedimentation, and reformation) and relate this representation to the surface geology of Nicaragua.
			Develop and use a classification key for rocks based on physical characteristics and method of formation.
			Describe examples of mechanical and chemical weathering of rocks.
			Differentiate between weathering and erosion, and explain the role of water in each process.
			Document the natural surface geological features of the local environment and provide explanations for the origin of those features.
			Relate mechanical (e.g., wind and water), chemical (e.g., acid rain and rusting), and biological (e.g., lichens, mosses, and tree roots) weathering processes to the formation of soils.
			Collect, with permission, and examine samples of local soils to determine their physical properties (e.g., color, odour, texture, presence of organic matter, pore size, and air and water holding capacity).
			Classify soil samples according to their characteristics (e.g., sand, loam, and clay composition) and research ways to enrich soils for specific uses (e.g., vegetable garden, road building, dam construction, waste management, and sports field).
			Identify predominant soil types (e.g., black, dark brown, brown, and grey).
	Earth & Space Science: Shaping Earth's Surface- Plate Tectonics (PT)		
	Analyze societal and environmental impacts of historical and current catastrophic geological events, and scientific understanding of movements and forces within Earth's crust.		Trace the development of plate tectonics theory as an explanation for movement of Earth's lithosphere in light of new geological evidence, including knowledge of tectonic plates and movement at plate boundaries.
			Construct a visual representation of the composition of Earth, including the crust, upper and lower mantle, core, and inner core.
			Lithospheric plates the size of continents and oceans move at rates of centimetres per year in response to movements in the mantle.
			Earthquakes are sudden motions along breaks in the crust called faults and that volcanoes and fissures are locations where magma reaches the surface.
			Major geologic events such as earthquakes, volcanic eruptions, and mountain building, result from plate motions.
			Understand how to determine the epicentre of an earthquake and know that the effects of an earthquake on any region vary, depending on the size of the earthquake, the distance of the region from the epicentre, the local geology, and the type of construction in the region.
			Explore major features of North, South and Central American geology (including mountains, faults, volcanoes) in terms of plate tectonics.
			Describe societal and environmental impacts of some catastrophic geological events, including earthquakes, tsunamis, and volcanic eruptions, which have occurred on or near Earth's surface and predict the impacts of future events.
			Create models or simulations of the processes of mountain formation and the folding and faulting of Earth's surface, including movements at diverging, converging, and transform plate boundaries.
			Work cooperatively with group members to research catastrophic geological events and integrate individual findings into a chronological model or time scale of major events in Earth's geological history.
	Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment.		Describe and recognize examples of mechanical and chemical (Acid rain, rust, salt in oceans) weathering of rocks.
			Differentiate between weathering and erosion, and explain the role of water in each process. (reshaping the landscape).
			Understand and represent how streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.
			Beaches are dynamic systems in which the sand is supplied by rivers and moved along the coast by the action of waves.
			Students understand and investigate how earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.

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Where We Are in Place and Time	**Earth & Space Science: Our Solar System (SS)**		
	Research and represent the physical characteristics of the major components of the solar system, including the sun, planets, moons, asteroids, and comets that orbit the sun in predictable paths.		Use a variety of sources and technologies to gather and compile pertinent information about the physical characteristics of the major components of the solar system.
			The Sun, an average star, is the central and largest body in the solar system and is composed primarily of hydrogen and helium.
			The solar system includes the planet Earth, the Moon, the Sun, eight other planets and their satellites, and smaller objects, such as asteroids and comets.
			The path of a planet around the Sun is due to the gravitational attraction between the Sun and the planet.
			Analyze historical and current technological developments that have enabled human observation of the major components of the solar system.
			Use star charts and astronomy guides to investigate the night sky, including constellations, and record observations using notes in point form, data tables, simple diagrams, and/or charts.
			Create scale-distance and/or scale-size models to represent the major components of the solar system.
			Evaluate the usefulness and accuracy of scale-distance and scale-size models of the major components of the solar system.
			Explain how evidence is continually questioned in order to validate scientific knowledge about the solar system.
	Assess the efficacy of various methods of representing and interpreting astronomical phenomena, including phases, eclipses, and seasons.		Examine how people of different cultures have recorded (e.g., Mayan calendar, Stonehenge, pyramids) and used understandings of astronomical phenomena (e.g., positions of the stars and/or planets) to solve practical problems such as the appropriate time to plant and harvest crops, to support navigation on land and water, or to foretell significant events through stories and legends.
			Examine ways in which humans have represented understanding of or interest in astronomical phenomena through music, dance, drama, visual art, or stories.
			Demonstrate how Earth's rotation causes the day and night cycle and how Earth's 23.5° tilt and revolution around the sun causes the yearly cycle of seasons.
			Model the relative positions of the sun, Earth, and moon to demonstrate moon phases and lunar and solar eclipses.
			Propose questions related to astronomical phenomena to investigate using models and simulations, such as "Do other planets exhibit phases?", "How would seasons on Earth differ if Earth were not tilted?", "How would patterns of eclipses change if the sun, Earth, or moon were different diameters or positioned at different locations?".
	Evaluate past, current, and possible future contributions of space exploration programs including space probes and human spaceflight, which support living and working in the inner solar system.		Investigate how astronauts are able to meet their basic needs (e.g., food, water, shelter, and waste elimination) while living and working in space.
			Describe instances where scientific ideas and discoveries have led to new inventions and applications (e.g., lunar buggy, space shuttle, Canadarm, Dextre, and the International Space Station) that support human exploration of space and which have extended scientific knowledge related to living and working in space.
			Identify potential personal, societal, technological, and environmental barriers to living and working in space.
			Design a model of a habitable space vehicle that can travel to and return from a student-selected location in the inner solar system.
			Investigate the work being done in preparation for future space travel and make predictions about future achievements related to living and working in space.

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How We Express Ourselves	**Physical Science: Principles of Flight (FL)**		
	Examine connections between human fascination with flight and technologies and careers based on the scientific principles of flight.		Observe and describe physical characteristics and adaptations that enable birds (e.g., ravens, hawks, loons, geese, hummingbirds, sandpipers, cranes, and sparrows), insects (e.g., mosquitoes, dragonflies, grasshoppers, bees, wasps, and butterflies), and bats to fly.
			Examine the role of inspiration and aesthetic design in the development of flying devices (e.g., initial attempts at trying to fly were based on observations of birds).
			Research technological problems that had to be overcome to develop devices that fly (e.g., balloons, kites, gliders, airplanes, helicopters, and rockets) and explain how various creative solutions to those problems have resulted in the development of flying devices with different designs.
			Describe examples of traditional and modern technologies developed by other cultures that are based on principles of flight (e. g., atlatl, bow and arrow, slingshot, catapult, boomerang, and trebuchet).
	Investigate how the forces of thrust, drag, lift, and gravity act on living things and constructed devices that fly through the air.		Diagram how the forces of thrust, drag, lift, and gravity act on living things or devices that fly through the air.
			Use scientific terminology appropriately (e.g., thrust, drag, lift, and gravity) when communicating ideas about the principles of flight.
			Generate questions related to the principles of flight and rephrase those questions in a testable form (e.g., rephrase a question such as “Why can some gliders travel farther than others?” to “What effect does wing shape have on the distance a glider can travel?”).
			Describe the role of lift in overcoming gravity and enabling devices or living things to fly.
			Determine how lift is affected by the shape of a surface by planning and carrying out steps to investigate the effect of wing shape on lift.
			Describe and represent methods for altering drag in flying devices, such as a bird spreading wings or an airplane employing flaps.
	Design a working prototype of a flying object that meets specified performance criteria.		Assess the characteristics of flying objects (e.g., balloon, kite, glider, airplane, helicopter, and rocket).
			Construct a prototype of a flying object that meets student-specified performance and aesthetic criteria.
			Work collaboratively with classmates to define criteria for judging the performance and aesthetics of a prototype of a flying object.
			Work collaboratively to collect relevant observations and data to evaluate the performance of a prototype of an object that will fly.
			Demonstrate and explain the importance of selecting appropriate processes for investigating scientific questions and solving technological problems (e.g., explain why it is important to change one variable while keeping others constant in designing and testing prototypes of flying objects).
			Analyze personally collected data and suggest improvements to a prototype design.
			Communicate procedures and results of prototype design, construction, testing, and evaluation in a technical design report.
			Identify new questions or problems about flight that arise through the prototype design process.
			Propose designs for futuristic flying devices that meet a particular student-identified need.
			Use technological problem-solving skills and knowledge acquired from previous investigations, to design and build devices that use forces to create controlled movement (e.g., an airplane propelled by hand or by an elastic band; a boat that holds paper clips and moves through water using magnets; a crane that lifts a load; a timed marble run)

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How the World Works	**Physical Science: Thermal Energy (TE)**		
	Examine how heat moves in a predictable flow from warmer objects to cooler objects until all the objects are at the same ure.		Energy can be carried from one place to another by heat flow or by waves, including water, light and sound waves, or by moving objects.
			That when fuel is consumed, most of the energy released becomes heat energy.
			Students know heat flows in solids by conduction (which involves no flow of matter) and in fluids by conduction and by convection (which involves flow of matter).
			Students know heat energy is also transferred between objects by radiation (radia-tion can travel through space).
	Physical Science: Understanding Electricity (EL)		
	Assess personal, societal, economic, and environmental impacts of electricity use and propose actions to reduce those impacts.		Conduct investigations to determine the attraction and repulsion of electrostatically charged materials and represent the results of those investigations using drawings, sketches, tables, charts, and/or other representations.
			Describe how results of similar and repeated investigations into the characteristics of static electric charges (e.g., the rubbing together of different substances) may vary and suggest possible explanations for identified variations.
			Identify natural and man-made applications of static electric charge and discharge (e.g., lightning, photocopiers, laser printers, air filters, and electrostatic paint sprayers).
			Pose questions related to the physical properties of conductors, insulators, simple circuits, and electromagnets (e.g., “How can we determine if an unknown material is a conductor or an insulator?”, “How does a switch work in a simple electric circuit?”, “What materials work best to create an electromagnet?”).
			Make predictions, based on observed patterns of events, related to the physical properties of conductors, insulators, simple circuits, and electromagnets and conduct investigations to test those predictions.
			Identify appropriate tools, instruments, and materials (e.g., bulbs, batteries, and wires) to use when investigating the properties of conductors, insulators, simple circuits, and electromagnets and use those tools and apparatus in a manner that ensures personal safety and the safety of others.
			Test the conductivity of a variety of solids and liquids, following a given set of procedures, to identify which materials are conductors and which are insulators, and draw conclusions about the types of materials that work best as conductors and which work best as insulators.
			Explain the role of switches in electrical circuits.
	Explain and model the properties of simple series and parallel circuits.		Propose questions to investigate, and practical problems to solve, related to simple series and parallel circuits (e.g., “What happens when a light bulb is removed from a series or parallel circuit?”, “How can I create a simple circuit using only a battery, light bulb, and one wire?”, “How are light circuits in a house wired?”).
			Construct and test various combinations of simple electric circuits to determine similarities and differences between series and parallel circuits.
			Draw electrical circuit diagrams to represent simple series and parallel circuits using appropriate symbols (e.g., battery, conductor, light bulb, motor, and switch).
			Design, construct, and troubleshoot an electrical circuit that meets one or more student-specified criteria.

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How We Organize Ourselves	**Life Systems : Diversity of Living Things (DL)**		
	Examine how humans organize understanding of the diversity of living things.		Construct and use a classification system to organize living things into groups and subgroups according to student-developed criteria.
			Demonstrate how different classification systems can be used to classify the same set of objects and explain how humans develop and refine classification systems to meet specific needs.
			Describe how aspects of worldviews (e.g., holistic, interconnectedness, valuing of place-based knowledge) shape their systems of organizing understanding of living things.
			Illustrate the diversity of living things on Earth by constructing a visual representation (e.g., poster, mobile, slide show, etc..) showing examples from each kingdom of the five kingdom taxonomic model: monera, protists, fungi, plants, and animals.
			Use appropriate scientific terminology to communicate ideas about the diversity of living things (e.g., biotic, abiotic, kingdom, phylum, monera, protist, fungi, plant, animal, vertebrate, and invertebrate).
	Recognize, describe, and appreciate the diversity of living things in local and other ecosystems, and explore related careers.		State the characteristics that define all living things (e.g., are made up of one or more cells, require energy for life processes, respond to stimuli in their environment, and have the ability to reproduce).
			Observe and document the diversity of living things in their local habitat through journaling, a nature walk, sketching, drawing, photographing, video recording, or other means.
			Show respect for other people, living things, and the environment when observing ecosystems.
			Document the diversity of living things in different terrestrial and aquatic habitats (e.g., grasslands, forests, tundra, deserts, rivers, ponds, and oceans) using print, video, and/or online resources.
			Identify examples of science and technology-related careers and workplaces which require an understanding of the diversity of living things (e.g., naturalist, zoo keeper, palaeontologist, and wildlife biologist).
	Analyze the characteristics and behaviors of vertebrates (i.e., mammals, birds, reptiles, amphibians, and fish) and invertebrates.		Identify characteristics of vertebrates and invertebrates and classify animals as vertebrates or invertebrates from drawings, videos, pictures, lists, and/or personal observations.
			Compare and represent characteristics and behaviors (e.g., body shape, body description, method of respiration, method of reproduction, method of movement, and method of feeding) of student-selected examples of vertebrates.
			Compare and represent characteristics and behaviors (e.g., body shape, body description, method of respiration, method of reproduction, method of movement, and method of feeding) of student-selected examples of invertebrates (e.g., arthropods, annelids, echinoderms, molluscs, and nematodes).
			Propose questions for inquiry that arise from personal investigations of characteristics and behaviors of animals.
			Suggest reasons why current biological classification systems for living things are based on structural (internal) characteristics rather than solely on physical appearance or behavior.
	Examine and describe structures and behaviors that help individual living organisms survive in their environments in the short term and species of living organisms adapt to their environments in the long term.		Propose questions to investigate related to the structures and behaviors that help organisms survive in their environments (e.g., "What advantage are different beaks for birds?", "Why do owls turn their heads to look sideways?", "Why do rabbits change color at different times of the year?", "Why do caribou migrate?", "Why do ground squirrels hibernate?").
			Show interest and curiosity in learning about organisms' adaptations to different environments by journaling, participating in a nature walk, or sharing science-related information about adaptations (gathered from print or video resources or personal experience) with classmates.
			Describe examples of structures and behaviors, including seasonal changes, which help living things survive in their environments during the lifetime of the organism.
			Describe examples of adaptations to structures and behaviors (e.g., flippers, webbed feet, night-time vision, wide wings, camouflage coloring, migration, and hibernation) that have enabled living things to adapt to their environments in the long term.
			Explain how scientists use fossils and the fossil record as a source of information to identify changes or diversity in species over long periods of time.
			Suggest reasons why specific species of organisms have or might become endangered or extinct.
			Gather information from a variety of sources (e.g., Elder, traditional knowledge keeper, naturalist, textbook, non-fiction book, museum display, encyclopaedia, and website) to answer student-generated questions about the structural and behavioral adaptations of organisms.
			Compare closely-related animals that live in different parts of the world and propose explanations for any differences in their structures and behaviors.
			Research the advantages of particular structures or behaviors of organisms that suit different environments (e.g., how different bird beaks are best suited to obtain different types of food, how different types of foot structure are best suited for different environments).
			Suggest reasons to explain how the results of similar and repeated studies of the adaptations of organisms may vary and suggest possible explanations for variations (e.g., independent studies may reveal different responses by polar bears to temperature changes or pollution).

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How We Organize Ourselves			**Life Systems : Diversity of Living Things (DL)**
	Assess effects of microorganisms on past and present society, and contributions of science and technology to human understanding of microorganisms.		Choose and correctly use appropriate tools (e.g., magnifying glasses, optical microscopes, and video microscopes) to study living organisms that cannot be seen with the naked eye.
			Observe and represent, using words and diagrams, characteristics of micro-organisms obtained from student- or teacher-collected water samples (e.g., bottled water, tap water, rain barrel, pond, creek, slough, and river water).
			Explain how micro-organisms meet their basic needs, including moving around and obtaining food, water, and oxygen.
			Design and conduct an investigation of the factors that influence how quickly micro-organisms break down organic matter (e.g., build a composter in a 2L plastic bottle and vary conditions such as the amount of water, soil, light, and combinations of waste products).
Sharing the Planet			**Life Systems: Ecology and Biodiversity (EB)**
	Organisms in ecosystems exchange energy and nutrients among themselves and with the environment.		Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organ-ism through food webs.
			Using a food web, trace how matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
			Populations of organisms can be categorized by the functions they serve in an ecosystem.
			Different kinds of organisms may play similar ecological roles in similar biomes.
			Investigate your local environment and its organisms. Determine that the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.