San Juan del Sur Day School

Grade 4 Science Learning Outcomes and Unit Guide

Unit	Learning Outcomes	✓	Performance Indicators
Who We Are	**Physical Science: Light and Electrical Devices (LI)**		
	Investigate the characteristics and physical properties of natural and artificial sources of light in the environment.		Differentiate between natural (e.g., fire, sun, star, lightning, aurorae, fireflies, and bioluminescent fungi) and artificial (e.g., light bulb, street light, glow stick, LED, tanning lamp, and laser) sources of light in the environment.
			Examine relationships between the light energy and heat energy emitted from light sources.
			Investigate the characteristics of light beams in air and water, including determining that light travels in straight lines, that light travels away from a source in all directions, and that light beams may change direction upon entering or leaving water.
			Distinguish, through observation, between objects that emit their own light (e.g., sun, glow stick, match, star, and light bulb) and those that reflect light from another source (e.g., moon, mirror, paper, clothing, and roadways).
			Identify positive (e.g., increased vitamin D production, happiness, and increased productivity) and negative (e.g., sunburn, skin cancer, and light pollution) consequences of exposure to natural and artificial sources of light.
			Predict changes in a shadow's location, shape, and relative size when an object is placed in different positions and orientations relative to a light source and surface (e.g., flashlight and puppet, and overhead projector and screen).
			Collaboratively plan and carry out a procedure to determine changes in a shadow's location, shape, and relative size when an object is placed in different positions and orientations relative to a light source and screen.
	Analyze how light interacts with different objects and materials to create phenomena such as shadows, reflection, refraction, and dispersion.		Pose questions about the interaction of light with different materials (e.g., How are shadows formed? How can we change the direction of light? What colors are in light?).
			Investigate how light interacts with various objects to determine whether the objects cast shadows, allow light to pass, and/or reflect light.
			Classify materials and objects as opaque, transparent, or translucent based on personal observations.
			Design and carry out a fair test of the reflective properties of surfaces of different shapes and textures (e.g., mirrors, flat foil, crumpled foil, white paper, colored paper, and spoons).
			Develop simple conclusions about the reflective properties of surfaces of different shapes and textures based on observation and experimentation.
			Students know the color of light striking an object affects the way the object is seen.
			Students know objects are seen when light travels from the object and enters the eye.
	Assess personal, societal, and environmental impacts of light-related technological innovations including optical devices.		Assess positive and negative consequences of artificial sources of light (e.g., street light, automobile headlight, traffic light, emergency vehicle light, and lighted advertising sign) that have been designed to solve problems in the home, at school, and in the community.
			Assess the suitability of translucent, transparent, and opaque materials for specific applications (e.g., window, shower curtain, paper, light bulb, and frosted glass).
			Compare the types of light sources used historically and currently in homes and communities.
			Design, construct, and test a prototype of an optical device (e.g., periscope, telescope, and microscope) that performs a specific student-identified function.
			Work with classmates to troubleshoot problems with a prototype of an optical device.
			Describe practices that individuals and communities can take to help protect eyes and sight.
	Explain and model magnetism and the many useful applications in everyday life.		Build a simple compass (pin, bottlecap, magnet) and use it to detect magnetic effects, including Earth's magnetic field.
			Understand that electric currents produce magnetic fields and know how to build a simple electromagnet (battery, nail, wire)
			Students know the role of electromagnets in the construction of electric motors, electric generators, and simple devices, such as doorbells and earphones.
			Investigate how electrically charged objects attract or repel each other.
			Students know that magnets have two poles (north and south) and that like pole repel each other while unlike poles attract each other.
			Investigate how energy can be converted to heat, light, and motion.

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Where We Are in Place and Time	**Earth & Space Science: Rocks, Minerals, and Erosion (RM)**		
	Investigate physical properties of rocks and minerals, including rock cycle and those found in the local environment.		Pose questions about the properties of rocks and minerals (e.g., What is the difference between rocks and minerals? Where do we find rocks and minerals? Do rocks become minerals?).
			Document the locations and characteristics of rocks that exist in their local environment.
			Observe and record physical properties of rocks and minerals using appropriate terminology such as color, luster, hardness, cleavage, transparency, and crystal structure.
			Identify questions to investigate arising from practical problems and issues related to the study of Earth's geological resources (e.g., "What types of rocks are best for cement-making.") If possible have an inquiry with an expert helper to help children explore different rocks for making cement.
			Record observations of rocks and minerals using jot notes, labelled diagrams, and charts.
			Compare the physical properties of rocks and minerals from the local environment with those from other geological areas.
			Develop a classification scheme to organize their understanding of rocks and minerals.
			Differentiate between rocks and minerals.
			Develop simple generalizations about the physical characteristics of rocks and minerals based on observation and research.
	Assess how human uses of rocks and minerals impact self, society, and the environment.		Discuss ways in which people of different cultures value, respect, and use rocks and minerals, including First Nations and Elders connections to Mother Earth.
			Identify objects in their local environment that are made from rocks and minerals (e.g., nickel, table salt, pottery, cement, carvings, brick, jewelry, bicycle, nutrients, battery, copper wiring, soda can, plumbing pipe, and sidewalk).
			Research historical (e.g., flint arrowhead, gold jewelry, paint pigment, and coal heating) and contemporary (e.g., fertilizer, building products, ceramics, glass, salt, silver fillings, and electronics) uses for rocks and minerals in students environments.
			Suggest alternative materials that could be used to create everyday objects or propose new uses for rocks and minerals.
			Analyze issues related to the extraction and use of minerals from the perspectives of various stakeholders (e.g., company owner, employee, scientist, Elder, environmental group, and end user).
			Research ways in which products made from rocks or minerals can be recycled and reused.
			Assess their own and their family's impact on natural resources based on their current lifestyle.
	Analyze how weathering, erosion, and fossils provide evidence to support human understanding of the formation of landforms on Earth.		Construct a visual representation of the diversity of landscapes and landforms throughout Nicaragua including their school landscape.
			Examine the effects of natural phenomena (e.g., tidal wave, flash flood, hurricane, tornado, earthquake, mudslide, forest fire, volcanoes and meteor impact) that cause rapid and significant changes to the landscape.
			Recognize that some changes in the earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.
			Explain how rocks can be classified as igneous, sedimentary, or metamorphic based on the processes by which they formed and their properties (rock cycle).
			Natural processes, including freezing and thawing and the growth of roots, cause rocks to break down into smaller pieces.
			Identify common rock-forming minerals (including quartz, calcite, feldspar, mica, and hornblende) and ore minerals by using a table of diagnostic properties.
			Discuss practices and techniques (e.g., mulching, crop rotation, strip farming, windbreaks, terracing, and sediment basins) for minimizing and controlling erosion locally and in communities around the world.
			Design and construct a prototype of a system for minimizing and controlling gravitational, water, shoreline, or wind erosion in a given situation.
			Understand that water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (Weathering, Transport, and Deposition).
			Describe possible short- and long-term effects of wind, water, and ice on local, national, and global landscapes (e.g., sandy beaches, coastline erosion, rounded rock formations, sand dunes, river deltas, glacial deposits, and cracks in rocks).
			Discuss how fossils and the fossil record provide evidence of Earth's history, including the formation of various landforms.
			Pose new questions about Nicaraguan landforms based on what was learned.

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How We Express Ourselves	**Physical Science: Sound (SO)**		
	Explore natural and artificial sources of sound in the environment and how those sounds are detected by humans and animals.		Identify and classify, using student-developed criteria, examples of natural and artificial sounds in their environments (e.g., classroom, school, home, playground, and community).
			Relate natural and artificial sources of sounds in their environment to the ways in which those sounds are produced.
			Describe examples of sounds (e.g., radio, alarm clock, fire alarm, and whistling steam kettle) that people use to meet their everyday needs.
			Explain how humans and other animals use sounds for various purposes such as enjoyment, warning, navigation, annoyance, ambience, and communication.
			Examine connections between music of various cultures, and natural sounds (e.g. water moving, bird flying, and wind blowing).
			Differentiate among the types of sounds produced by various stringed, woodwind, brass, and percussion instruments.
			Illustrate and explain how humans create and detect sounds.
			Compare the characteristics of human and animal perceptions of sound, including their sense organs to detect sound and their range of hearing.
			Propose structural modifications that might improve the hearing of a specific animal.
			Predict and explore how sound travels from different sources to the human ear.
	Draw conclusions about the characteristics and physical properties of sound, including pitch and loudness, based on observation.		Pose questions about the characteristics of sound (e.g., Why are some sounds louder than others? Why do sounds sound different? Why are some locations noisier than other locations?).
			Recognize and demonstrate that sound energy originates from vibrating objects (e.g., larynx, tuning fork, radio speaker, and musical instruments).
			Compare how sound vibrations travel differently through solids, liquids, and gases such as air.
			Compare the ability of different materials to absorb and reflect sounds of varying pitch and loudness.
			Compare the ability of self and others to hear sounds of various pitch and loudness.
			Compare the characteristics (e.g., construction and method of vibration) of string, woodwind, brass, and percussion instruments to determine how they make sound.
			State generalizations about the physical characteristics of sound, including pitch and loudness, learned through observation.
	Assess personal, societal, and environmental impacts of sound-related technologies.		Investigate the type and loudness of sounds heard in various locations in their environment (e.g., classroom, hallway, gymnasium, music room, library, lunch room, and playground).
			Explain how and why different materials are used in schools and other buildings based on their ability to absorb and/or reflect sounds.
			Explore the importance and uses of sound in different cultures, past and present.
How the World Works	**Physical Science: Pulleys and Gears (PG)**		
	Evaluate the impact of pulleys and gears on society and the environment.		Assess the impact of pulley systems and gear systems on daily life (elevators allow physically challenged access, bicycles use gears, joystick, clothesline, sewing machine).
			Assess environmental impacts of using machines with pulleys and gears, taking different perspectives into account (perspective of car driver or cyclist).
			Suggest ways to minimize negative impacts and maximize positive impacts (Escalators run all the time, clothesline vs. dryer; both use pulley and gears but both dry cloths. Gears on a bike still take effort but a car is faster; why do we bike? Save environment)
	Investigate ways in which pulleys and gears modify the speed and direction of, and the force exerted on, moving objects.		Identify pulley systems (e.g., clotheslines, flagpoles, cranes, elevators, farm machinery) and gear systems (e.g., bicycles, hand drills, can openers) that are used in daily life, and explain the purpose and basic operation of each.
			Explain gear system on how a bicycle works (e.g. by the largest gear on the front moving to a small gear on the back.
			Use technological problem-solving skills to design, build, and test a pulley or gear system that performs a specific task (Sample problems: Design, build, and test a mechanism that will raise and lower a flag. Design, build, and test a changing billboard. Design, build, and test a model elevator that could be used in a barn. Design, build, and test a model drawbridge for a castle.)

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How We Organize Ourselves	**Life Systems : Habitats and Communities (HC)**		
	Investigate the interdependence of plants and animals, including humans, within habitats and communities.		Identify the plants and animals which can be found in the communities (e.g., house, village, farm, reserve, and city) in which students live.
			Differentiate between populations, communities, and habitats using local and regional examples.
			Predict and research the populations of plants and animals that exist in various habitats (e.g., desert, farmland, meadow, tree, forest, rain puddle, seashore, lake, river, tropical forest, tundra, river delta, and mountains).
			Discuss stories that demonstrate the interdependence of land, water, animals, plants, and the sky in traditional worldviews.
			Classify plants and animals, including humans, according to their role(s) (e.g., producer, consumer, herbivore, omnivore, carnivore, predator, prey, scavenger, and decomposer) in food chains and food webs.
			Construct a visual representation of a specific food chain that exists within a habitat or community.
			Conduct a simulation or role play to demonstrate the interdependence of plants and animals in a habitat or community.
			Observe and maintain a habitat such as a terrarium, aquarium, mealworm box, ant farm, pond in a bottle, or vermiculture to examine interactions between plants and animals, and their environments.
			Students know plants are the primary source of matter and energy entering most food chains.
			Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animal.
			Students know ecosystems can be characterized by their living and nonliving components.
			Students know that most microorganisms do not cause disease and that many are beneficial.
	Analyze the structures and behaviors of plants and animals that enable them to exist in various habitats.		Generate questions to investigate about the structures (e.g., beak shape, color markings, type of feet, and thorny branches) and behaviors (e.g., seasonal migration, living in groups, and growing towards light) of plants and animals that enable them to exist within various habitats (e.g., schoolyard, wildlife reserve area, and creek bank).
			Recognize that each plant and animal depends on a specific habitat to meet its needs. Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.
			Identify factors (e.g., availability of food, water, and shelter, weather conditions, and available living space) that influence the ability of plants and animals to meet their needs within a specific habitat.
			Record observations and information about plant and animal structures and behaviors within natural and constructed habitats using words, diagrams, graphs, photographs, audio and video recordings, and other appropriate technologies.
			Compile and display data collected during a habitat study using tallies, tables, pictographs, and/or bar graphs; compare results obtained with those of other class members; and propose explanations for differences in results.
			Compare the structural features of plants that enable them to thrive in different kinds of habitats (e.g., bog, forest, grassland, school yard, garden, and sports field).
			Design and carry out a simulation to explore how the appearance of a plant or animal affects its visibility.
			Predict the structural and behavioral adaptations required for a real or imagined animal to live in a habitat, either real or imagined.
			Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.
Sharing the Planet	**Life Systems : Habitats and Communities (HC)**		
	Assess the effects of natural and human activities on habitats and communities, and propose actions to maintain or restore habitats.		Recognize and discuss the role of traditional knowledge in learning about, valuing, and caring for plants and animals within local habitats and communities.
			Categorize human activities by the effects they have or may have on habitats and communities.
			Assess intended and unintended consequences of natural and human-caused changes to specific habitats.
			Create dramatic, visual, musical, or other representations to show how personal actions can help conserve, honor, and respect natural and constructed habitats.
			Collaboratively develop and carry out (if feasible) a plan to preserve or restore one or more components of a local habitat.