San Juan del Sur Day School
Grade 7 Science Learning Outcomes and Unit Guide

Unit	Learning Outcomes	✓	Performance Indicators
Who We Are	**Life Science: Structure and Processes (SP)**		
	All organisms have external parts that they use to perform daily functions to make sense of phenomena and solve problems.		All living things are made up of cells. In organisms, cells work together to form tissues and organs that are specialized for particular body functions.
			Animals engage in behaviors that increase the odds of reproduction. An organism's growth is affected by both genetic and environmental factors.
			Plants use the energy from light to make sugars through photosynthesis. Within individual organisms, food is broken down through a series of chemical reactions that rearrange molecules and release energy.
			Each sense receptor responds to different inputs, transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain resulting in immediate behavior or memories.
			Conduct an investigation to provide evidence that living things are made of cells, either one cell or many different numbers and types of cells.
			Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
			Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
			Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
			Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
			Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
			Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
Where We Are in Place and Time	**Earth and Space Science: Earth's Crust and Resources (EC)**		
	Analyze scientific understanding and explanations for movements and forces within the Earth's crust.		Analyze societal and environmental impacts of historical and current catastrophic geological events, and scientific understanding of movements and forces within Earth's crust.
			Construct a visual representation of the composition of Earth, including the crust, upper and lower mantle, core, and inner core.
			investigate and interpret evidence that Earth's surface undergoes both gradual and sudden change (e.g., recognize earthquakes, volcanoes and landslides as examples of sudden change; recognize glacial erosion and river erosion as examples of gradual/incremental change)
			Provide examples of past theories and ideas, including cultural mythology, that explain geological phenomena such as volcanic activity, earthquakes and mountain building.
			Explain the operation of tools scientists use to measure and describe the effects of catastrophic geological events, including earthquakes and volcanoes (e.g., seismograph, Mercalli intensity scale, and Richter magnitude scale).(Indirect)
	Investigate and interpret evidence of major changes in landforms and the rock layers that underlie them.		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.
			Investigate and interpret patterns in the structure and distribution of mountain formations (e.g., describe and interpret mountain formations of the North American cordillera)
			Interpret the structure and development of fold and fault mountains.
			Describe evidence for crustal movement, and identify and interpret patterns in these movements (e.g., identify evidence of earthquakes and volcanic action along the Pacific Rim; identify evidence of the movement of the Pacific plate relative to the North American plate)
			Identify and interpret examples of gradual/incremental change, and predict the results of those changes over extended periods of time (e.g., identify evidence of erosion, and predict the effect of erosional change over a year, century and millennium; project the effect of a given rate of continental drift over a period of one million years).
	Identify locations and processes used to extract Earth's geological resources and examine the impacts of those locations and processes on society and the environment.		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 or road construction?" and "What are some environmental concerns related to open-pit mining?").
			Distinguish between rocks and minerals using physical samples, pictures, and/or video recordings and identify the minerals most often found in rocks in Nicaragua and around the world
			Classify rocks and minerals based on physical properties such as color, hardness, cleavage, lustre, and streak.
			Identify locations of Nicaragua's primary mineral resources and their primary uses.
			Evaluate different approaches taken to answer questions, solve problems, and make decisions when searching for geological resources within Earth (e.g., trial-and-error prospecting versus core sampling).
			Identify uses for rocks and minerals, such as healing, recuperative powers, and ceremonies, which include ideas not explained by science.

How We Express Ourselves

Physical Science: Mixtures and Solutions (MS)

Outcome		Indicator
Distinguish between pure substances and mixtures (mechanical mixtures and solutions) using the particle model of matter.		Examine a variety of objects and materials, and record qualitative (e.g., color, texture, and state of matter) and quantitative (e.g., density, melting point, and freezing point) physical properties of those objects in a chart or data table.
		Describe the characteristics of pure substances, mechanical mixtures, and solutions.
		Construct a graphic organizer for the classification of matter that includes mixtures, pure substances, elements, compounds, mechanical mixtures, and solutions.
		Classify common substances (e.g., Kool-Aid, vinegar, bubble bath, soft drinks, juice, chocolate chip cookies, salad dressings, hand lotion, shampoos, tea, bread, soil, and concrete) as pure substances, mechanical mixtures, or solutions.
		Listen to and consider the ideas of classmates when classifying materials as pure substances or mixtures.
		Create mechanical mixtures and solutions using common materials and compare the physical properties of the original materials and the resultant mixture or solution.
		State the four main ideas of the particle model of matter.
		Create models and/or physical representations that depict the nature of particles in pure substances, mechanical mixtures, and solutions according to the particle model of matter.
		Analyze the usefulness of personally constructed representations of particles and the strengths and limitations of models in science generally.
		Generate questions related to differences between mixtures and solutions and rephrase in a testable form (e.g., rephrase a question such as “How sweet is iced tea?” to “What is the most iced tea that can be dissolved in 500 mL of water at 23°C?”).
Investigate methods of separating the components of mechanical mixtures and solutions, and analyze the impact of industrial and agricultural applications of those methods.		Describe methods used to separate the components of mechanical mixtures and solutions, including mechanical sorting, filtration, evaporation, distillation, magnetism, and chromatography.
		Trace the historical development of a technology or process used to separate mixtures (e.g., settling, sifting, filtering, fusion, distillation, and chromatography).
		Describe common household examples of technologies that are used to separate components of mechanical mixtures or solutions (e.g., kitchen strainer, oil and air filters).
		Design and conduct an experiment to determine the effectiveness and/or efficiency of one or more methods of separating mechanical mixtures and solutions.
		Report the strengths and limitations of a chosen experimental design to determine the effectiveness and/or efficiency of one or more methods of separating mechanical mixtures and solutions.
		Use tools and apparatus (e.g., safety glasses, glassware, and Bunsen burners) safely when conducting investigations into methods of separating mixtures.
		Demonstrate knowledge of WHMIS standards by using proper techniques for handling and disposing of lab materials and following warning label symbols, including common household product symbols, when separating mixtures.
		Describe the scientific principles underlying a past or present industrial technology designed to separate mixtures (e.g., petroleum refining, sewage treatment plant, recycling station, combine, and cream separator).
		Discuss intended and unintended consequences of a particular industrial or agricultural technology or process used for separating materials.
		Use a technological problem-solving process to design, construct, and evaluate a prototype of a process or device for separating a mechanical mixture or solution (e.g., purifying drinking water, separating household waste).
		Identify new questions and problems that arise from what was learned about solutions and mixtures (e.g., “Are there mixtures that cannot be separated?”, “What techniques are used to remove pollutants from air and water?”), including questions that science cannot answer.
Investigate the properties and applications of solutions, including solubility and concentration.		Provide examples of solid, liquid, and gaseous solutions and identify which substance is the solute and which is the solvent in each solution.
		Describe the characteristics of solutions using the terms solute, solvent, soluble, and insoluble, based on the particle model of matter.
		Create and describe the concentration of student-prepared dilute, concentrated, saturated, and supersaturated solutions using those qualitative terms and quantitative measurements (e.g., parts per million [ppm], g/L, and g/100 mL).
		Value accuracy, precision, and honesty when collecting and reporting data related to concentrations of solutions.
		Investigate the factors that determine how quickly a solute dissolves in a solvent.
		Gather and interpret information from various resources (e.g., nutrition labels on foods, newspaper or magazine articles) related to solutions and concentrations of solutions.
		Design and implement an experiment to investigate the effect of temperature on the solubility of a solution.
		Predict the solubility of a solute by interpolating or extrapolating from student-generated solubility curves.
		Analyze the effects of technological inventions or processes related to solutions (e.g., water softeners, water treatment plants, solution mining, agricultural sprays, insecticides, bleaches, and drain cleaners) on self, community, and the environment.
		Research how various science disciplines and engineering fields study and apply scientific knowledge related to solutions.
		Assess environmental and economic impacts of past and current land use practices in Nicaragua (e.g., agriculture, urban development, recreation, and road construction), and describe intended and unintended consequences of those practices on self, society, and the environment, including soil degradation. (Indirect)

Physical Science: Heat and Temperature (HT)

How the World Works

Assess the impact of past and current heating and cooling technologies related to food, clothing, and shelter on self, society, and the environment.		Investigate and interpret examples of heat-related technologies and energy use in the past (e.g., investigate uses of heat for domestic purposes, such as cooking or home heating, and for industrial processes, such as ceramics, metallurgy or use of engines).
		Trace linkages between human purposes and the development of heat-related materials and technologies (e.g., development of hair dryers and clothes dryers; development of protective clothing, such as oven mitts, ski suits and survival clothing).
		Identify and explain uses of devices and systems to generate, transfer, control or remove thermal energy (e.g., describe how a furnace and wall thermostat keep a house at a constant temperature).
		Identify examples of personal and societal choices in using energy resources and technology (e.g., identify choices that affect the amount of hot water used in their daily routines; identify choices in how that water is heated).
Explain how understanding differences between states of matter and the effect of heat on changes in state provide evidence for the particle theory.		Compare heat transmission in different materials (e.g., compare conduction of heat in different solids; compare the absorption of radiant heat by different surfaces).
		Explain how heat is transmitted by conduction, convection and radiation in solids, liquids and gases.
		Describe the effect of heat on the motion of particles; and explain changes of state, using the particle model of matter.
		Distinguish between heat and temperature; and explain temperature, using the concept of kinetic energy and the particle model of matter.
		Investigate and describe the effects of heating and cooling on the volume of different materials, and identify applications of these effects (e.g., use of expansion joints on bridges and railway tracks to accommodate thermal expansion).
Apply an understanding of heat and temperature in interpreting natural phenomena and technological devices		Describe ways in which thermal energy is produced naturally (e.g., solar radiation, combustion of fuels, living things, geothermal sources and composting).
		Describe examples of passive and active solar heating, and explain the principles that underlie them (e.g., design of homes to maximize use of winter sunshine)
		Compare and evaluate materials and designs that maximize or minimize heat energy transfer (e.g., design and build a device that minimizes energy transfer, such as an insulated container for hot drinks; evaluate different window coatings for use in a model home).
		Explain the operation of technological devices and systems that respond to temperature change (e.g., thermometers, bimetallic strips, thermostatically-controlled heating systems).
		Describe and interpret the function of household devices and systems for generating, transferring, controlling or removing thermal energy (e.g., describe in general terms the operation of heaters, furnaces, refrigerators and air conditioning devices).
		Investigate and describe practical problems in controlling and using thermal energy (e.g., heat losses, excess energy consumption, damage to materials caused by uneven heating, risk of fire) .
		Identify and evaluate different sources of heat and the environmental impacts of their use (e.g., advantages and disadvantages of fossil fuel use; compare the use of renewable and nonrenewable sources in different applications).
		Identify positive and negative consequences of energy use, and describe examples of energy conservation in their home or community.

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How We Organize Ourselves	Life Science: Interactions within Ecosystems (IE)		
	Observe, illustrate, and analyze living organisms within local ecosystems as part of interconnected food webs, populations, and communities.		Illustrate the ecological organization of life within the biosphere, using specific examples of species, populations, communities, ecosystems, and biomes.
			Provide examples of ecosystem of varying sizes and locations.
			Conduct a field study to observe, record (using sketches, notes, tables, photographs, and/or video-recordings), and identify living and nonliving components of a local ecosystem, showing respect for all forms of life when examining ecosystems.
			Choose and use appropriate instruments (e.g., magnifying glass, thermometer, light meter, hand-held microscope, and digital camera) safely, effectively and accurately to investigate living and nonliving components of ecosystems.
			Compile and display ecological data to illustrate the various interactions that occur among living and nonliving components of ecosystems.
			Identify strengths and weaknesses of different methods of collecting and displaying ecological data (e.g., compare field observations of an ecosystem with observations from a video or television program, compare a food chain with a food web)
			Classify organisms in a variety of ecosystems as producers, consumers, or decomposers and further classify consumers as herbivores, carnivores, or omnivores.
			Interpret interdependence within natural systems by constructing food chains and food webs to illustrate the interactions among producers, consumers, and decomposers in a particular ecosystem.
	Evaluate biogeochemical cycles (water, carbon, and nitrogen) as representations of energy flow and the cycling of matter through ecosystems.		Illustrate how energy is supplied to and flows through a food web using the concept of ecological pyramids (e.g., pyramid of energy, pyramid of numbers, and pyramid of biomass).
			Explain the role of decomposers in recycling matter in an ecosystem.
			Describe examples of how scientists collect evidence, search for patterns and relationships in data, and propose explanations to further the development of scientific knowledge about energy and matter flow in ecosystems.
			Design and conduct an experiment to investigate the conditions essential for the growth of plants (e.g., determine whether nutrients in soil are sufficient to support plant growth, determine the influence of sunlight or other forms of light on plant growth).
			Identify and evaluate potential impacts on energy and matter flow of the removal of one or more living organisms from a specific ecosystem.
			Provide examples of scientific knowledge that have resulted in the development of technologies that are designed to assist in managing aspects of ecosystems (e.g., understanding the effect of nitrogen, phosphorus, and potassium on plant growth led to the production of specific formulations of fertilizers, knowledge of how microorganisms help break down matter led to the development of composting bins).

Sharing the Planet	Life Science: Interactions within Ecosystems (IE)		
	Analyze how ecosystems change in response to natural and human influences, and propose actions to reduce the impact of human behavior on a specific ecosystem.		Identify evidence of ecological succession in ecosystems, using the concepts pioneer species, climax community, primary succession, and secondary succession and by identifying changes in plant and animal life in the ecosystem.
			Propose ecological questions to investigate arising from practical problems and issues (e.g., "What is the impact of clearing land for farming?", "How could a community prolong the life of its landfill site?", "How could a community reduce the amount of garbage it produces?", "What is the impact of a sports field being constructed in a particular location?").
			Ecosystem characteristics vary over time. Disruptions to any part of an ecosystem can lead to shifts in all of its populations. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.
			Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on (e.g. water purification and recycling).
			Predict what a specific ecosystem (e.g., clear-cut forest, abandoned sports field, abandoned farm yard) will look like in the future (e.g., 5, 10, and 25 years) based on characteristics of the area and long-term changes observed in similar ecosystems.
			Identify and delimit questions and problems related to the effects of natural or human influences on a particular ecosystem (e.g., delimit a problem related to research on the impact of forest fires on ecological succession).
			Select and synthesize information from various human, print, and electronic sources to develop a response to specific questions related to natural or human influences on a particular ecosystem.
			Propose a course of action or defend a given position on a local ecological issue or problem related to natural or human influences on a particular ecosystem, taking into account scientific, societal, technological, and environmental factors.
			Provide specific examples to illustrate that scientific and technological activities related to ecosystems take place in a variety of individual or group settings, locally and globally, and by men and women from a variety of cultural backgrounds (e.g., individual and community gardening, impact studies done by environmental engineers, and research done by teams of international scientists).