



## Linking ON Science Curriculum to Binogi: GRADE 9

• Understanding Life Systems = A • Understanding Structures and Mechanisms = B • Understanding Matter and Energy = C • Understanding Earth and Space Systems = D

Strand	Overall Expectations Category	Overall Expectation	Specific Expectation Category	Specific Expectation	Binogi Video
STEM Skills and Connections	A1	<b>STEM Investigation and Skills:</b> apply scientific processes and an engineering design process in their investigations to develop a conceptual understanding of the science they are learning, and apply coding skills to model scientific concepts and relationships	1.1	apply a scientific research process and associated skills to conduct investigations, making connections between their research and the scientific concepts they are learning	<a href="#">Science and pseudoscience</a>
			1.2	apply a scientific experimentation process and associated skills to conduct investigations, making connections between their observations and findings and the scientific concepts they are learning	<a href="#">Scientific method - Chemistry</a> <a href="#">The scientific method - Physics</a>
			1.3	apply an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems	<a href="#">The scientific method - Biology</a> <a href="#">Scientific knowledge</a>
			1.4	apply coding skills to investigate and to model scientific concepts and relationships	<a href="#">Programming (all videos)</a>
			1.5	apply their knowledge and understanding of safe practices and procedures, including the Workplace Hazardous Materials Information System (WHMIS), while planning and carrying out hands-on investigations	<a href="#">The chemistry lab</a> <a href="#">Heat sources in the science lab</a> <a href="#">Laboratory apparatus</a>
	A2	<b>Applications, Careers, and Connections:</b> analyse how scientific concepts and processes can be applied in practical ways to address real-world issues and in various careers, and describe contributions to science from people with diverse lived experiences	2.1	design an experiment or a prototype to explore a problem relevant to a STEM-related occupation, such as a skilled trade, using findings from research	N/A
			2.2	describe how scientific innovations and emerging technologies, including artificial intelligence systems, impact society and careers	<a href="#">What is technology?</a> <a href="#">Satellites</a> <a href="#">Internet</a>
			2.3	analyse how the development and application of science is economically, culturally, and socially contextualized, by investigating real-world issues	<a href="#">Vaccines in the world</a> <a href="#">Coronaviruses and Covid-19</a> <a href="#">Terraforming Mars</a> <a href="#">Satellites</a> <a href="#">Internet</a>





			2.4	apply scientific literacy skills when investigating social and environmental issues that have personal, local, and/or global impacts	<a href="#">Scientific report</a>
			2.5	analyse contributions to science by people from various communities, including communities in Canada	<a href="#">The history of biology</a> <a href="#">From Aristotle to classical physics</a> <a href="#">From classical to modern physics</a>
Biology: Sustainable Ecosystems and Climate Change	B1	<b>Relating Science to Our Changing World:</b> assess impacts of climate change on ecosystem sustainability and on various communities, and describe ways to mitigate these impacts	1.1	assess impacts of climate change on the sustainability of local and global ecosystems, describe local or global initiatives for combatting climate change, and identify solutions to address some of the impacts	N/A
			1.2	assess impacts of climate change on communities in Canada, including First Nations, Métis, and Inuit communities	N/A
			1.3	investigate and explain how sustainable practices used by various communities, including First Nations, Métis, and Inuit communities, reflect an understanding of the importance of the dynamic equilibrium of ecosystems	<a href="#">Sustainable Development</a> (all videos)
	B2	<b>Investigating and Understanding Concepts:</b> demonstrate an understanding of the dynamic and interconnected nature of ecosystems, including how matter cycles and energy flows through ecosystems	2.1	investigate interactions between the biosphere, hydrosphere, lithosphere, and atmosphere, and explain why these interactions are important for ecosystem sustainability	<a href="#">The Earth's spheres</a>
			2.2	explain how naturally occurring phenomena, including the cycling of matter and the flow of energy, contribute to the dynamic equilibrium within and between ecosystems	<a href="#">Food chains and food webs</a> <a href="#">The nutrient chain</a> <a href="#">Ecological pyramids</a> <a href="#">Cycles in Nature</a> (all videos)
			2.3	compare and contrast the processes of cellular respiration and photosynthesis, and explain how their complementary relationship contributes to the dynamic equilibrium of ecosystems	<a href="#">Aerobic and anaerobic respiration</a> <a href="#">Photosynthesis</a> <a href="#">Gas exchange in plants</a>
			2.4	investigate factors and processes, including biodiversity, air and water quality, soil health, and succession, and explain how they contribute to ecosystem sustainability	<a href="#">Biodiversity</a>





					<a href="#">Role of different species in a community</a> <a href="#">Ecological niche, biotope and habitat</a> <a href="#">Soil: Introduction</a> <a href="#">Ecosystem services</a>
			2.5	explain the effects of various human activities on the dynamic equilibrium of ecosystems	<a href="#">Hazardous waste</a> <a href="#">Bioaccumulation</a> <a href="#">Water pollution and eutrophication</a> <a href="#">Acidification: Acid rain</a> <a href="#">Deforestation</a> <a href="#">Overfishing</a>
			2.6	identify and use various indicators of climate change to describe the impacts of climate change on local and global ecosystems, and analyse how human activities contribute to climate change	<a href="#">The environmental impact of humans</a> <a href="#">The impact of human pollution</a> <a href="#">Environmental impact of transportation</a> <a href="#">The impact of human pollution: Megacities</a> <a href="#">Air quality and pollution</a>
			2.7	explain how sustainable practices related to the cycling of matter and the flow of energy can be applied in agricultural innovations	N/A
Chemistry: The Nature of Matter	C1	<b>Relating Science to Our Changing World:</b> assess social, environmental, and economic impacts of the use of elements, compounds, and associated technologies	1.1	assess social, environmental, and economic impacts of processes associated with the life cycle of consumer products, considering the elements and compounds used to make them, and suggest ways to enhance positive impacts and/or minimize negative impacts	<a href="#">Consumerism</a>
			1.2	analyse impacts of using emerging chemical technologies in various fields, including in the skilled trades, and assess factors that influence the development of these technologies	N/A





	C2	<b>Investigating and Understanding Concepts:</b> demonstrate an understanding of the nature of matter, including the structure of the atom, physical and chemical properties of common elements and compounds, and the organization of elements in the periodic table	2.1	investigate properties, changes, and interactions of matter that are important for the dynamic equilibrium of ecosystems and their sustainability	N/A
			2.2	research the role of experimental evidence in the development of various atomic models, and compare and contrast different models of the atom	N/A
			2.3	identify the location, relative mass, and charge of subatomic particles within an atom, using the Bohr-Rutherford model	<a href="#">The parts of the atom</a> <a href="#">Atomic mass</a> <a href="#">Electron shells</a> <a href="#">Introducing the atom</a>
			2.4	explain the relationship between the position of an element in the periodic table and the structure of its atoms, using models	<a href="#">The periodic table of elements</a> <a href="#">Periods and groups in the periodic table of elements</a>
			2.5	investigate the physical and chemical properties of elements, and use their findings to relate these properties to the organization of the periodic table, classify elements, and identify patterns in the periodic table	<a href="#">Periodic Table (all videos)</a>
			2.6	investigate and describe physical and chemical properties of elements and compounds, including those that make up common household products	<a href="#">Soap</a> <a href="#">Detergents and soaps</a>
			2.7	describe the relationship between the structure of simple compounds and their chemical formulas	<a href="#">Assembling a salt</a>
Physics: Principles and Applications of Electricity	D1	<b>Relating Science to Our Changing World:</b> assess social, environmental, and economic impacts of electrical energy production and consumption, and describe ways to achieve sustainable practices	1.1	assess social, environmental, and economic benefits and challenges resulting from the production of electrical energy from various sources	<a href="#">The power grid</a> <a href="#">Hydroelectric power</a> <a href="#">Renewable energy sources</a> <a href="#">Fossil energy sources</a> <a href="#">Biomass energy sources</a> <a href="#">Combined heat and power generation (CHP)</a>
			1.2	evaluate how electrical energy production and consumption impact various communities locally or globally, and describe ways to achieve sustainable practices	<a href="#">Electricity consumption</a> <a href="#">Green electricity</a> <a href="#">Conservation of energy in the household</a>





D2			1.3	develop a plan of action to address a local or global electrical energy production or consumption issue, including strategies for energy conservation	<a href="#">Conservation of energy in the household</a>	
			1.4	analyse social, environmental, and economic impacts of emerging technologies related to electrical energy production, consumption, storage, and conservation	N/A	
	Investigating and Understanding <b>Concepts:</b> demonstrate an understanding of the nature of electric charges, including properties of static and current electricity			2.1	conduct investigations to explain the behaviour of electric charges in static and current electricity, and to relate the observed behaviour to the properties of subatomic particles and atomic structure	<a href="#">Static electricity</a> <a href="#">Charge distribution on the surface of a conductor</a> <a href="#">Charge distribution on the surface of a conductor: Examples</a>
				2.2	determine the conductivity of various materials by investigating their ability to hold or transfer electric charges	<a href="#">Electrical conductivity of metals</a> <a href="#">Conductors and insulators</a>
				2.3	identify the components of a direct current (DC) circuit and explain their functions, and identify electrical quantities, their symbols, and their corresponding International System of Units (SI) units	<a href="#">AC/DC – alternating and direct current</a> <a href="#">Measuring current, voltage, and resistance</a>
				2.4	investigate the relationships between electric current, potential difference, and resistance in electrical circuits, and develop a mathematical model to represent the relationships	<a href="#">Voltage and current</a> <a href="#">Units of voltage, current and resistance</a> <a href="#">Ohm's Law</a> <a href="#">Electrical resistance</a> <a href="#">Measuring current, voltage, and resistance</a>
				2.5	apply a mathematical model to calculate electric current, potential difference, and resistance in real-world situations	<a href="#">Power, Current and voltage</a>
				2.6	construct series and parallel circuits to compare electric current, potential difference, and resistance in both types of circuits	<a href="#">Circuits in series and in parallel</a>
				2.7	explain the difference between electricity and electrical energy	<a href="#">Green electricity</a>
				2.8	determine the efficiency of various electrical devices that consume or produce electrical energy, and identify the energy transformations in each device	<a href="#">The transformer</a> <a href="#">The electric motor</a>





Earth & Space Systems: Space Exploration	E1	<b>Relating Science to Our Changing World:</b> evaluate social, environmental, and economic impacts of space exploration and of technological innovations derived from space exploration	1.1	evaluate social, environmental, and economic impacts of space observation and exploration	<a href="#">Reasons to explore space</a> <a href="#">Space Junk</a>
			1.2	evaluate how space observation and exploration technologies contribute to our understanding of climate change, natural disasters, and other phenomena	<a href="#">Satellites</a> <a href="#">Reasons to explore space</a>
			1.3	assess ways in which technological innovations related to space observation and exploration are applied in various fields, including their contributions to sustainable practices on Earth	<a href="#">Space probes</a> <a href="#">Reasons to explore space</a> <a href="#">Space and the human body</a> <a href="#">The International Space Station</a>
	E2	<b>Exploring and Understanding Concepts:</b> demonstrate an understanding of the components, characteristics, and associated phenomena of the solar system and the universe, and the importance of the Sun to processes on Earth	2.1	describe the importance of the Sun and its characteristics, including its role in the solar system and in sustaining life on Earth	<a href="#">The Sun</a>
			2.2	explain how the Sun's energy causes natural phenomena on Earth, and how these phenomena contribute to renewable energy production	<a href="#">Renewable energy sources</a> <a href="#">Green electricity</a>
			2.3	summarize observational evidence used to support theories about the origin and evolution of the universe and the solar system, considering diverse ways of knowing	<a href="#">Astronomy throughout history</a> <a href="#">Introduction to cosmology</a> <a href="#">Mysteries of cosmology</a> <a href="#">The Big Bang</a>
			2.4	describe major components of the solar system and the universe and compare their characteristics	<a href="#">The solar system</a> <a href="#">The rocky planets</a> <a href="#">The gas giants</a> <a href="#">Mars: The red planet</a> <a href="#">Venus: Earth's sister</a> <a href="#">The Earth: Spinning seasons</a> <a href="#">The Sun</a> <a href="#">The universe and the life of stars</a> <a href="#">Understanding galaxies</a>





			2.5	quantify distances in the solar system and the universe by applying an understanding of relative distances and sizes and using appropriate units of measure	<a href="#">The universe: Distances and proportions</a>
			2.6	conduct investigations to explain the causes of various astronomical phenomena that can be observed from Earth	<a href="#">Supernova</a> <a href="#">The universe and the life of stars</a>

\*Curriculum Expectation were adapted from *The Ontario Curriculum: Science and Technology Grade 9*. Toronto: Ministry of Education and Training (2022) <https://www.dcp.edu.gov.on.ca/en/curriculum/secondary-science/courses/snc1w/strands>

