Science 3-8

CURRICULUM COMPANION DOCUMENT

Description and Rationale

This companion document for New Brunswick elementary and middle block science (grades 3-8) is designed to help any educator implement the program at their school(s) regardless of their years of teaching, training, or experience in this subject area.

Educators can utilize this document to support a variety of engaging instructional practices, hands-on investigations, and group activities. To develop scientific literacy, diverse learning experiences provide opportunities to explore, analyze, evaluate, synthesize, appreciate, and understand the interrelationships among science, technology, society, and the environment. Inquiry learning, investigation, sensemaking, communication, responsible and sustainable application skills are highlighted within this document through instructional practices.

This companion document is a tool aligned to the design of learning areas which includes strands, big ideas and skill descriptors for educators looking to support achievement of learning. To utilize the document effectively, educators should become familiar with the New Brunswick Curriculum Framework and understand the knowledge and skills that learners demonstrate through achievement indicators. This companion document contains instructional strategies, labs, inquiry opportunities, potential assessments, and background information to support prescribed curriculum delivery.

Core Concepts

The contexts for each elementary and middle block science grade are listed below, concepts specific to each science grade can be found within the New Brunswick Curriculum Framework.

Elementary Block: Science

- Science 3: Our Local Environment
- Science 4: Properties and Uses of Earth Materials
- Science 5: Living and Technological Systems

Middle Block: Science

- Science 6: Wayfinding and Making Sense of Your World
- Science 7: Earth Surface Processes
- Science 8: Beyond Earth: Human Presence in the Solar System

Assessment

Examples of science formative assessment strategies:

Concept map	Investigation	Think-pair-share
Observation	Checklist/rubric	Quiz (low stakes)
Relay race	Response to text/activity	Classroom poll
Demonstration	Reflective scientific journal	Strategic questioning
Presentation	Self- and peer-assessment	Role-play
Escape room	Career portfolio	Hand-In-Pass-Out
Technology applications	Entrance/exit slip	Mini whiteboards
Quick-extension project	Predict-explain-observe	Polly (Microsoft Teams)

Educator Strategies and Templates: this SharePoint site includes curated Education and Early Childhood Development (EECD) suggestions for assessment strategies.

Summative assessment is used to inform the achievement of learning for a reporting period or a program of study. This may be a combination of performance tasks – final presentation, test, project, essay, etc.

- Assessing, Evaluating, and Reporting K-12: this SharePoint site includes report card guideline documents and other New Brunswick education assessment supports.
- Edutopia: this website provides resources to help implement six strategies: project-based learning, social and emotional learning, comprehensive assessment, teacher development, integrated studies, and technology integration.
- Myron Dueck Educational Consulting: this website helps educators generate ideas and navigate issues surrounding grading, assessment, reporting and student voice.

Effective Teaching Strategies

Experiential and inquiry-based learning approaches are effective teaching strategies for elementary and middle block science. These teaching strategies involve active engagement with science experiences, critical thinking, and problem solving that matters to learners and educators. Below are suggested pedagogies that are described in the New Brunswick Curriculum Framework:

- Holding All Learners in the Highest Regard
- Safe and Positive Spaces for Learning
- Direct Instruction
- Experiential Learning
- Relevant Learning
- Play and Inquiry-Based Learning

INQUIRY-BASED LEARNING

Inquiry-based learning is fundamental to science skill development. Below are some effective science inquiry-based strategies for developing New Brunswick science curriculum Big Ideas, particularly: **Investigation**, **Sensemaking**, and **Communication**. The Smarter Science Framework (2011) and National Research Council's A Framework for K-12 Science Education (2012) both add context and detail for science assessment and evaluation strategies.

New Brunswick Science Big Idea: **Investigation**

- Initiate and Plan: encourage learners to identify a problem or need through curious observation; define testable questions, research, and consider possible answers and solutions; revisit observations and predictions to improve testable questions.

  Learners form hypotheses from observations, questions, and research. Develop observation and questioning skills by providing science prompts (e.g., Phenomena for Next Generation Science Standards).
- Perform and Record: encourage learners to develop and safely carry out investigations; observe, collect, and record results.

  Learners develop observation and recording skills by maintaining scientific journals or notebooks for observations, thoughts, and reflections. Provide opportunities for learners to experiment and test hypotheses and answer questions. Consider knowledge and skills related to variables, controls, and the scientific process. Encourage learners to use tools and/or technology to amplify their senses and accurately record data.

New Brunswick Science Big Idea: **Sensemaking**

- Analyze and Interpret: encourage learners to review results carefully by examining data and identifying patterns; decide what results mean; evaluate and refine solutions.

  Once learners carry out investigations, the focus shifts to analysis and evaluation of data, determining meaning or sensemaking.

New Brunswick Science Big Idea: **Communication**

- Communicate: encourage learners to explain procedures and results through various modes including writing, speaking, visual, or electronic forms; reflect on the scientific process and check with peers.

  Learners develop communication skills through opportunities to collaborate and share science concepts and ideas within the classroom and community.

SCIENTIFIC JOURNALING

Scientific journaling can be completed together with self-assessment and goal setting. Educators can model various examples of known scientists' journals to demonstrate learning and the scientific process. Learners demonstrate achievement of learning in the same way through scientific journal sketches, describing observations and ideas, asking questions, generating hypotheses, outlining next steps, and verbalizing learning goals (Gregory, Cameron, Davis, 2011).

FIELD TRIPS

Field trips provide learners opportunities to engage in authentic learning experiences. Field trips can be as simple as a walk or as complex as a specific site visit, for example the New Brunswick Mactaquac Dam. Learners will develop inquiry, observation, and reflection skills (White, 2018).

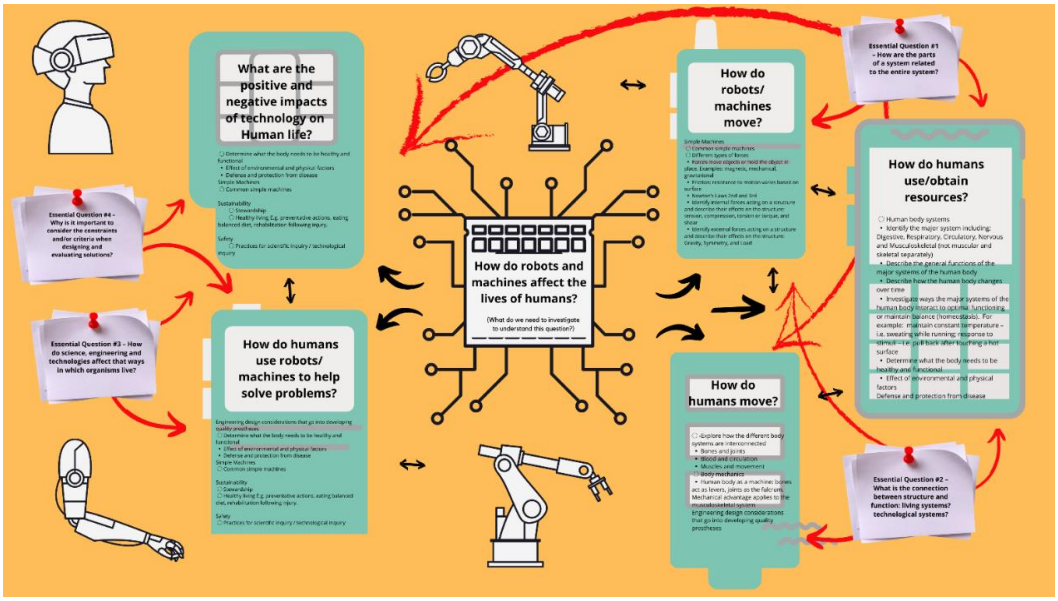
SIMULATIONS AND LABORATORY ACTIVITIES

Simulations and laboratory activities provide learners with immersive experiences to explore and practice science skills. They provide opportunities for learners to consider alternative perspectives (Sharifi, Ghanizadeh & Jahedizadeah, 2017).

SCIENCE STORYLINING

Next Generation Science Storylines: this website guides teams of teachers and teacher educators in developing coherent 3-dimensional storylines for elementary, middle, and high school classrooms, "[a] storyline is a coherent sequence of lessons, in which each step is driven by students' questions that arise from their interactions with phenomena. A student's goal should always be to explain a phenomenon or solve a problem … Together, what students figure out helps explain the unit's phenomena or solve the problems they have identified. A storyline provides a coherent path toward building disciplinary core idea and crosscutting concepts, piece by piece, anchored in students' own questions."

New Brunswick Virtual Learning Commons (NBVLC): *Grade 3 to 10 Science Curriculum PL* provides a possible route through science curriculum context and concepts. The professional learning course also includes Essential Questions referenced in this companion document. All New Brunswick educators have access to NBVLC and must register in the professional learning course to gain access to the resources. The following is an example of science storylines that are provided in *Grade 3 to 10 Science Curriculum PL*, Science 5 Living and Technological Systems:



Science as a Way of Knowing

An inclusive science program recognizes that Eurocentric science, or western science are not the only forms of empirical knowledge about nature and aims to broaden learner understanding of ways of knowing the world. The terms "traditional knowledge" and "Indigenous Knowledge" are examples sometimes used when referencing Indigenous or local First Nation knowledge systems. The dialogue between scientific researchers and traditional knowledge holders continues, and there are examples of individuals who may self-identify or be welcomed within more than one group. Different ways of knowing the world may intersect when asking critical questions like,

- Whose research is it?
- Who owns the research or knowledge?
- Whose interest does the research or knowledge serve?
- Who will benefit from the research or knowledge?
- Who has designed the research questions and framed its scope?
- Who will carry out/who carried out the research? Who will write the research or knowledge?
- How will the research or knowledge be disseminated?
  (adapted from Smith, 2012 p. 10)

Education researchers suggest that an enhanced science curriculum is one that supports both Indigenous and Eurocentric methods, represents complementary, not separate or conflicting realities, and broadens the purpose of science education to become knowing nature literacy.

"Two-Eyed Seeing means to see with the strengths of both Indigenous and Western knowledges. At times, certain problems or situations require us to privilege one or the other world view. At other times, the two work together in harmony. The two perspectives are not inherently compatible. For most of us, at least for now, Two-Eyed Seeing requires a great deal of conscious effort in order to respect the differences between the two perspectives and to focus on, and work from, a position of shared strengths." (Marshall, Marshall and Iwama, p. 177).

INDIGENOUS WAYS OF KNOWING

Traditional knowledge is a cumulative body of knowledge, know-how, practices and representations maintained and developed by Indigenous Peoples with extended histories of interaction with the natural environment, "Indigenous knowledge embodies webs of relationships within specific ecological contexts; contains linguistic categories, rules, and relationships unique to each knowledge system; has localized content and meaning; has established customs with respect to acquiring and sharing of knowledge … and implies responsibilities for possessing various kinds of knowledge." (Battiste, 2013 p. 96). These sophisticated sets of understandings, interpretations and meanings are part of a cultural complex that encompasses language, naming and classification systems, resource use practices, ceremony, spirituality and worldview (adapted from International Council for Science, 2002 as cited by Restoule, 2019). As an example, "Our culture is based on oral histories, meaning that what we need to know is passed on from generation to generation through oral histories, mentorship, and hands-on learning experience. The

Mi'kmaq used wampum, chewed birchbark, and wrote hieroglyphics; we also etched petroglyphs into stone as physical representations of information" (Mi'kmawey Debert Cultural Centre, 2015 p. 16).

SCIENTIFIC WAYS OF KNOWING

Scientific research, Eurocentric science, western science, are cumulative bodies of knowledge, know-how, practices, and representations that are actively developed and curated by scientists with histories of interactions. Some scientific bodies of knowledge are more widely known or valued in mainstream society, and some are less known or valued in mainstream society. To study the natural world, scientists use empirical methods, grounded in observations and experimentation, and rely on types of evidence and testing. These sets of understandings, interpretations, and meanings are part of cultural complexes that encompass language, naming and classification systems, resource use practices, conventions, and worldview, "There is no neutral knowledge system. All knowledge about nature is socially constructed. Thus, science based on certain accepted methodologies, on constructs such as reason, objective observation, and interpretation takes place in a context of contextualized assumptions, values, ideas, and beliefs" (Battiste, 2013 p. 119).

Essential Questions

Essential Questions provide a framework for exploration at each grade level. Answering the questions requires an in-depth analysis of the topic and could be explored in multiple ways. Below are some Essential Questions for each elementary and middle block science grade. Though the questions provide guidance on how to explore the prescribed content at each grade, educators can co-develop Essential Questions with their learners.

Science 3: Our Local Environment

- How do organisms obtain and use the matter and energy they need to live and grow?
- What happens to ecosystems when the environment changes?
- What regulates weather and climate and how does this effect our community?
- How can we apply science and technological solutions to mitigate habitat loss?

Science 4**:** Properties and Uses of Earth Materials

- How do humans change the planet?
- How do we determine the uses of Earth materials?
- What on Earth is in your stuff and where on Earth does it come from?
- What are some of the concerns related to extracting Earth materials sustainably? Design a solution to address a concern.

Science 5: Living and Technological Systems

- How are the parts of a system related to the entire system?
- What is the connection between structure and function in: living systems? technological systems?
- How do science, engineering and technologies affect that ways in which organisms live?
- Why is it important to consider the constraints and/or criteria when designing and evaluating solutions?

Science 6: Wayfinding and Making Sense of Your World

- What role does energy play in enabling living things (esp. humans) to sense their environment?
- How do we process different sensory stimuli (E.g., light, sound, different body position, etc.)?
- How does light (energy) behave in different materials?
- How does the interaction of our senses influence our perception of the world?
- How can light (or any other form of energy) be used to design innovative technologies that improve our lives?

Science 7: Earth Surface Processes

- How does thermal energy affect matter?
- How is energy transferred from one object or [between] system[s]?
- What factors interact and influence weather and climate?
- How does water influence weather, circulate in the oceans, and shape Earth's surface?
- What impacts are climate change [and severe weather] having on people, places and ways of life in New Brunswick?

Science 8: Beyond Earth: Human Presence in the Solar System

- How can one describe physical interactions between objects and within systems of objects?
- How does our place in the universe impact how forces are experienced?
- Why is space a place to explore?
- How do we know Earth's global climate is changing?
- How does the challenges/constraints of living and working in space stimulate creativity?

Resources to Support the Program

LABS AND ACTIVITIES:

Sample science activities have been included as suggestions to help support the program. Educators can use their professional judgement to determine if these resources compliment their teaching style.

Topic	Skill Descriptor	Link	Notes
Healthy Soils	Grade 3: Plan investigations to solve problems relating to the local natural world: weather and climate, habitats, plants, and animals.	Let's Talk Science/Parlons-sciences Healthy Soils (English) La Santé des Sols (Français)	Lesson plan/website Learners will discuss what the word "healthy" means in environmental contexts. Includes learner activities.
Recycling Materials	Grade 4: Communicate procedure, result, and conclusion of scientific inquiry using a variety of media.	Canadian Geographic Education/Éducation Canadian Geographic Classroom Energy Diet Challenge (English) Regime energetique en classe (Français)	Lesson plan/PDF Classroom challenge that encourages energy awareness and upcycling old materials.
Electronics and Prototyping	Grade 5: Collect data during scientific inquiry into simple machines or the human systems.	Brilliant Labs/Labos Créatifs Hack-a-Toy (English) Pirater un jouet (Français)	Lesson plan/website Inquiry questions: What are the different properties of the materials used? (e.g., mass, weight, volume, solubility, states of matter, hardness, malleability) Sometimes forces can transform matter, what are the different forces the toy uses?

Light Energy Behavior	Grade 6**:** Plan investigations to answer questions about relationships between and among variables observed in natural and technical sensory systems.	TE Engineering Light Stations (English)	Lesson plan/website Learners will discuss the phenomena of refraction, light is made up of waves, waves at different wavelengths create different colors, how a prism works, etc.
The Water Cycle	Grade 7: Plan investigations to answer questions about relationships between and among variables observed in matter and Earth surface processes.	Big Kid Science Earth and Space Science (English)	Lesson plan/website/e-textbook Inquiry question: How does water cycle through the hydrosphere and atmosphere?
The Water Cycle	Grade 7: Plan investigations to answer questions about relationships between and among variables observed in matter and Earth surface processes.	Let's Talk Science/Parlons-sciences What is the Water Cycle? (English) Qu'est-ce que le cycle de l'eau? (Français)	Lesson plan/website Learners design and create their own miniature model of the water cycle using simple materials as a way to demonstrate understanding of the process.
Ocean Pollution	Grade 7: Apply scientific and technological knowledge and an understanding of sustainable practices responsibly with respect to matter and Earth surface processes.	Resources for Rethinking/Ressources pour repenser Species at Risk Educator Guidebook (English) Species at Risk Student Workbook (English) Trousse Pédagogique Sur Les Espèces En Péril Guide De L'éducateur (Français) Trousse Pédagogique Sur Les Espèces En Péril Cahier De L'élève (Français)	Lesson plans/website/PDF Resources for Rethinking pairs with Ocean Wise resources. Learners discuss the humpback whale and climate change, the killer whale and ocean pollution, the great white shark and bycatch, the hawksbills sea turtle and plastic pollution, and the sea otter and loss of kelp habitat, and ways to take action to protect them.

Robotics and Space Technology	Grade 8: Communicate procedure, result, and conclusion using a variety of media and working collaboratively.	Canadian Space Agency/Agence spatiale canadienne Astrobot (English) Astrobot (French)	PDF Learners acquire the basics of programming and building a robot while conducting space missions.

Science Learning Environment Considerations

PHYSICAL SPACE - SAFETY

Science can be explored in a multitude of learning environments; outdoor learning is encouraged. When appropriate, consider alternative learning spaces where the science Big Ideas and Skill Descriptors can be engaged, such as outdoor classrooms, greenhouses, and science labs. Risk assessment is encouraged and depends on your school facilities and location, offsite risk assessments should be completed by the lead educator. If partnered with an external organization for outdoor learning, please inquire if they have completed a risk assessment.

An educator should consider the factors that may pose a potential risk or hazard to learners. Here are some preventative steps an educator can take:

- Focus the activity: identify the specific outdoor learning activity that will be conducted and the location; clearly identify the learning goals and curriculum skill descriptors.
- Identify potential hazards: the educator should identify potential hazards associated with the activity. Hazards can include things like uneven terrain, steep inclines, weather conditions, and potential encounters with wildlife. Educators need to review the location prior to taking learners. Assess likelihood and severity of the potential consequences. For example, a steep incline may be less severe than a deep body of water, but more likely to occur.
- Determine risk level: based on the likelihood and severity of each hazard, educators should determine the overall risk level associated with the activity. This can help to identify areas where additional precautions or risk management strategies may be needed.
- Develop a safety plan: the safety plan should be shared with learners, guardians, and relevant rightsholders or stakeholders before beginning outdoor learning activities.
- Conduct a safety briefing: prior to beginning the activity, the educator should conduct a safety briefing with learners to review the safety plan and highlight any specific risks or hazards.
- Provide appropriate supervision: educators should ensure that there is appropriate supervision during outdoor learning activities to minimize the risk of accidents or injuries. This may include additional adults on hand to help monitor learners.
- Provide appropriate equipment: educators should ensure that learners have appropriate equipment for the activity, such as sturdy footwear, rain gear, and sunscreen.

- Consider the weather: educators should be aware of weather conditions, react accordingly, and adjust (or postpone) the activity for learner safety.
- Plan for emergencies: educators should have a plan in place for dealing with emergencies, such as a learner becoming injured or lost during the activity.
- Conduct a post-activity review: after the activity is over, the educator should conduct a review of the safety plan and risk management strategies to identify areas for improvement. This follows the cycle of plan, do, check, act, found in The Learning Cycle - Formative Assessment.

The New Brunswick Environmental Network (NBEN) and Sustainability Education Alliance of New Brunswick (SEA) educational paper *Giving our Children an Experiential Edge-A Discussion Paper on Outdoor Learning in New Brunswick* provides additional information on outdoor education and can be retrieved via SEA-NB Documents.

ROUTINES

Outdoor learning activities require several routines for management of learners and their safety in an alternate classroom environment. Educators and learners will need to practice these routines.

- Muster point: determine a designated muster spot for direct instruction, safety, and collaboration opportunities.
- Recall signal: establish a signal that will bring the learners to you or the muster point (e.g., whistle, song, rhythmic clap, etc.)
- Boundaries: establish clear explicit boundaries for your learning space every time you conduct an outdoor learning activity.

Community Outreach/Curriculum Support

Name of Organization	Link	Notes
Association of Professional Engineers and Geoscientists New Brunswick (APEGNB)	APEGNB	The regulatory body for engineering and geoscience professionals and professionals in training practicing in New Brunswick or on provincial projects
Atlantic Coastal Action Program (ACAP)	ACAP Saint John	Climate Action resources and information. A community-based, non-profit organization that encourages communication, partnership, and active involvement from the community in managing the local environment.
Atlantic Canada Fish Farmers Association (ACFFA)	ACFFA	Information, career connections, educational resources. An industry funded association providing advocacy and resource support services for the salmon aquaculture industry operating in Atlantic Canada.
BC Hydro	Power Smart for Schools	K-12 resources and lesson plans. Supports clean energy, including conservation, sustainability, safety, energy, and electricity.
Berkeley – University of California	Understanding Science	K-12 lessons and resources, and review tips for modifying your current instruction. Emphasizes nature and process of science.
Big Kid Science	Activities/Resources	Resources and activities. Links Earth and space exploration.
Brilliant Labs	Brilliant Labs Labos Créatifs	A hands-on experiential learning platform empowering youth to learn through the integration of creativity, innovation and technology.
Canadian Geographic	Canadian Geographic Education Éducation Canadian Geographic	Lesson plans and activities. Includes Indigenous education resources, interactive maps, videos.

Canadian Space Agency	Youth and Educators Jeunes et éducateurs	Activities and projects by topic, grade level, and duration. Space activities and experiments developed by the Canadian Space Agency.
Carolina	Human Body Systems	Activities and PDFs. Resources for teaching about eleven human body systems.
Ducks Unlimited	Ducks Unlimited Canada Ducks Unlimited New Brunswick	Several project options and. Link to the New Brunswick branch present for a more local approach. Provides guidance on how conservation, restoration, and management of Canada's wetlands take place.
Exploratorium	Exploratorium	Located in San Francisco, California, the Exploratorium is a public learning laboratory exploring the world through science, art, and human perception.
The Gaia Project	The Gaia Project Le Projet Gaia	Curriculum links, classroom visits, and hands-on projects.
Government of Canada	Biokits	Interactive kits and observation guides for exploring biodiversity. Activities broken down by geographic location in Canada and through the Trans Canada Trail.
Government of Canada	Educational Resources Ressources pédagogiques	Activity books, resources, and links to websites. Government of Canada site for teaching and learning science and technology.
Government of New Brunswick	Centres of Excellence New Brunswick	K-12 activities, lesson plans, career connections and in-class supports for the areas of Health, Energy, Entrepreneurship, and Digital Innovation.
Hammond River Angling Association	Education	Educational programs and tours, camps and information. A non-profit environmental organization, whose mandate is to protect and preserve the New Brunswick Hammond River watershed through education, conservation, and community interaction.

Huntsman Marine Science Centre	Huntsman Education	Private not-for-profit social enterprise with an oceans focused mission that also conducts world-class aquatic contract research services and supports education.
Khan Academy	Khan Academy Science	Khan Academy offers practice science exercises, instructional videos, and a personalized learning dashboard that empower learners to study at their own pace in and outside of the classroom.
Learning for a Sustainable Future	Learning for a Sustainable Future L'Éducation au service de la Terre	K-12 sustainable education resources and lessons plans.
Let's Talk Science	Let's Talk Science Parlons-sciences	K-12 classroom resources, STEM activities, professional learning and project ideas.
Miramichi Salmon Association Inc.	Miramichi Salmon Association Conservation	In-class supports, educational programs, project ideas and partnerships.
Nashwaak Watershed Association Inc.	Nashwaak Watershed	Information, K-5 field trips, and educational resources.
Nature NB	Nature NB Nature NB	K-12 information, classroom, and group programs. Education kits and educator resources.
National Energy Education Development	NEED	Professional Development, lesson plans, activities, resources bundles.
Nemours KidsHealth	How the Body Works	Videos, worksheets, and articles to explore human body systems.
Next Generation Science Storylines	NGSS	Storylining is a strategy to help organize the science inquiry process in the classroom.
Ocean Wise	Ocean Wise Ocean Wise	Lesson plans including activities, resources, videos targeted towards oceanography and climate change.
Science Buddies	Science Buddies	Video lessons, lesson plans, STEAM classroom kits.
Science East	Science East	Located in Fredericton, NB. Contact for in-class and educational supports.

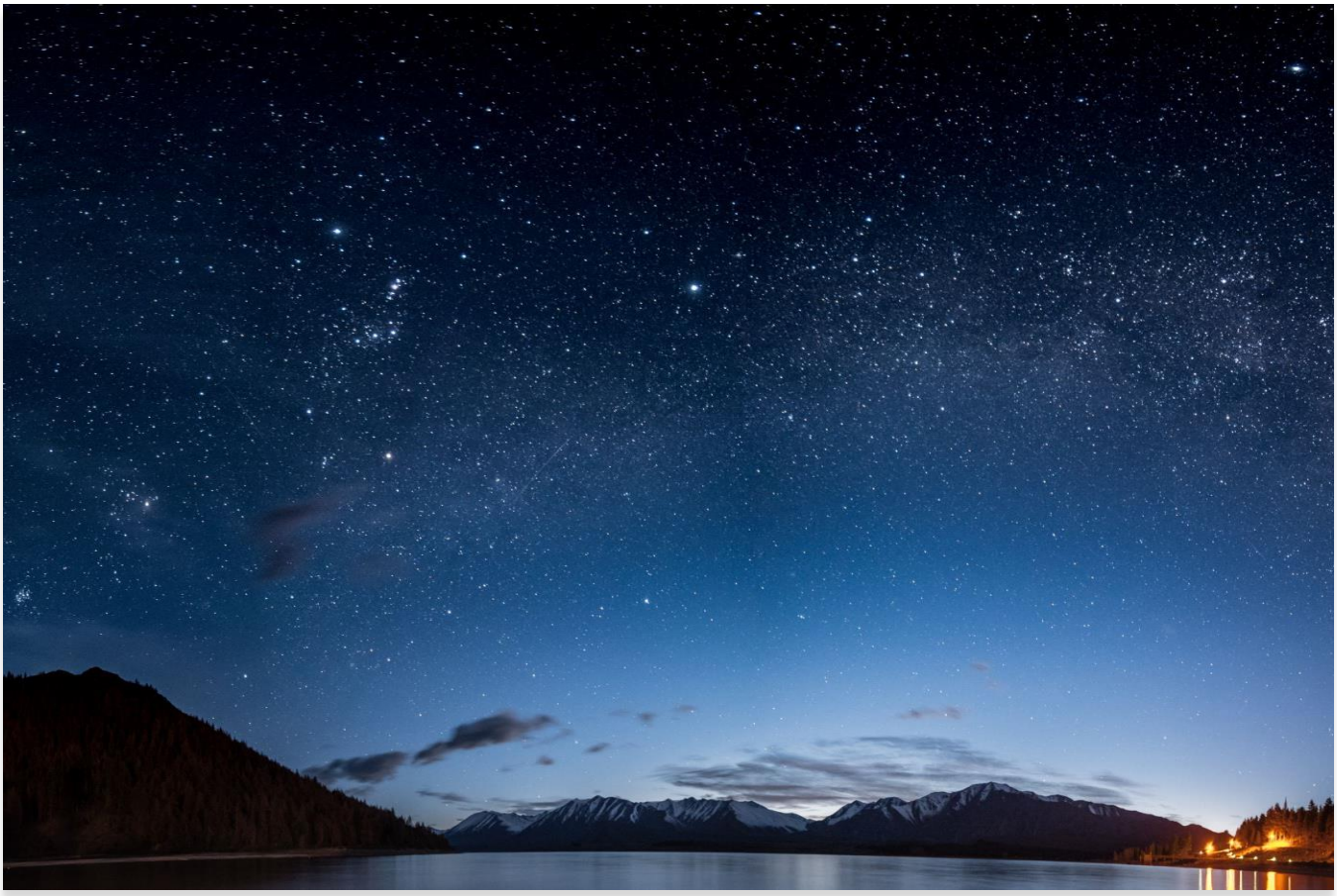
Science Journal for Kids	Science Journal for Kids	For grades 3-12, allows educators to filter articles by topic, language, reading level and scientific method. All the articles in this library are peer reviewed.
Statistics Canada	Resources for Educators and Students Ressources pour les éducateurs et les étudiants	Projects, infographics, videos on data literacy.
University of Colorado Boulder	PHET	Simulations for learners and educators to explore including variables.
University of Colorado Boulder	Teach Engineering	Multi-level lesson plans, hands-on activities, maker fun, for math, science and engineering learners and educators.
University of New Brunswick	Quartermain Earth Science Centre	Resources available on site, PL for teachers offered yearly, and opportunities for geologists to visit schools across NB.
United Nations Department of Economic and Social Affairs	Sustainable Development Goals	Detailed information, targets, indicators, and connections between the United Nations Sustainable Development Goals.
Vivify	Vivify STEM	Space exploration STEM activities and lesson plans, and space podcast.
Water Rangers	Water Rangers	K-12 lessons and resources, water test kits for purchase.
The Office of First Nation Education	World of Wisdom	First Nation contacts, resources, tutoring opportunities, PL offerings.
Youth Science Canada	Smarter Science Éduca sciences	Framework of science skills. Workshops, resources, national partner for STEM Fairs.

Cross-Curricular Connections

With a focus on inquiry skills and scientific exploration, there are numerous opportunities to authentically connect with other subject areas. Below you will find some exemplars of skill descriptors from other subject areas and where they potentially connect to science curriculum.

Subject	Skill Descriptor	Science Skill Descriptor
Mathematics	Grade 3: Explore graphs to solve problems.	Analyze data to construct explanations and conclusions based on evidence from scientific inquiry.
Mathematics	Grade 4: Estimate and measure using personal referents and measurement tools.	Collect data during scientific inquiry into the natural world.
Social Studies	Grade 4: Explain the importance of major physical features of the world.	Plan investigations to solve problems relating to the natural world: the Earth's crust, changes in the Earth's surface, rocks, minerals, soils, and uses of Earth's resources.
English Language Arts	Grade 5: Ask and respond to questions to clarify information, explore possibilities, and identify solutions to a problem.	Communicate procedure, result, and conclusion of scientific inquiry using a variety of media.
Personal Wellness	Grade 5: Assess personal health habits and their relationship to wellness.	Apply scientific and technological knowledge and an understanding of sustainable practices responsibly with respect to simple machines and human systems.
Physical Education	Grade 5: Refine and apply principles of stability and balance, on a variety of surfaces while participating in activities.	Collect data during scientific inquiry into simple machines or the human systems.
Mathematics	Grade 5: Interpret graphs to solve problems.	Analyze data to construct explanations and conclusions based on evidence from scientific inquiry.
English Language Arts	Grade 6: Summarize and present content to communicate facts, ideas, and opinions.	Communicate procedure, result, and conclusion using a variety of media and working collaboratively.
Physical Education	Grade 6: Apply social-emotional skills used in learning and performing physical activities, alone and with others.	Apply scientific and technological knowledge and an understanding of sustainable practices responsibly with respect to natural and technical sensory systems.

Mathematics	Grade 6: Justify elements and compare graphs to solve problems.	Analyze and interpret qualitative and quantitative data to construct explanations and conclusions.
Mathematics	Grade 7: Calculate measures of central tendency to solve problems.	Analyze and interpret qualitative and quantitative data to construct explanations and conclusions.
Social Studies	Grade 7: Analyze the effects of the distribution of wealth around the world.	Analyze and interpret qualitative and quantitative data to construct explanations and conclusions.
Mathematics	Grade 8: Compare and critique graphs and the presentation of data.	Communicate procedure, result, and conclusion using a variety of media and working collaboratively.



Glossary

A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z

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A

Accuracy	An evaluation criterion to determine the reliability, truthfulness and correctness of the content.
Adaptation	Process by which an organism becomes better suited for its environment.
Agriculture	The science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products.
Albedo	The portion of incident light reflected by a surface.
Aquaculture	The rearing of aquatic animals or the cultivation of aquatic plants for food.
Atmosphere	The envelope of gasses surrounding the earth or another planet.

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B

Behavior of Light	Dispersion – splitting of visible light into its component colors. Absorption – when light is transformed into energy. Transmission – movement of electromagnetic waves (sound, light, etc.) through an object.
Biodiversity	The variety of life in a particular habitat or ecosystem.
Biosphere	Regions of the earth's surface, atmosphere and hydrosphere that is occupied with living organisms.

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C

Carbon Cycle	The series of processes by which carbon compounds are interconverted in the environment, involving the incorporation of carbon dioxide into living tissue by photosynthesis and its return to the atmosphere through respiration, the decay of dead organisms, and the burning of fossil fuels.
Cell	Smallest unit of a living organism. The basic membrane-bound unit that contains the fundamental molecules of life and of which all living things are composed.
Climate	Long term patterns of weather in a particular region, including temperature, air pressure, humidity, precipitation, sunshine, cloud cover, and wind.
Climate Literacy Principles	1. The sun provides energy 2. Climate and life
Commodities	A raw material or primary agricultural product that can be bought and sold, such as copper or coffee
Conduction	The process of transmission of energy from one substance to another when the substances are in close contact.
Crop	A cultivated plant that is grown as food, especially a grain, fruit, or vegetable.
Convection	The transfer of thermal(heat) energy through the movement of a liquid or gas.
Cryosphere	The part of the earth's surface where water is in solid form. This includes sea ice, ice caps, ice sheets, glaciers...

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D

Dispersion	The separation of light based on its colour (wavelength).

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E

Earth's Crust	Outer layer of planet. Two types: oceanic and continental.
Earth Cycles	Rocks, tectonic and water changed within the Earth's surface.

Earth Systems	1. Geosphere - consists of the interior and surface of Earth, both of which are made up of rocks. 2. Biosphere – the smallest layer of the planet that can support living things. 3. Hydrosphere – portion of the Earth covered in water 4. Atmosphere – layer that wraps the Earth with gasses, such as oxygen, carbon dioxide (for photosynthesis), keeping the Earth warm and living things alive. 5. Cryosphere – Areas solely covered in ice (North and South Pole)
Ecosystems	Includes forests, waterways, coastal, and wetlands; and interactions between living and non-living components.
Electromagnetic radiation	All the different kinds of energies released into space by stars such as the Sun. These kinds of energies include radio waves, heat (infrared radiation) and light.
Electromagnetic System (EMS)	Measures the energy that travels in waves and spans a broad spectrum of waves.
External Forces	Gravity, symmetry, and load acting on a structure

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F

Forces	Action at a distance that can influence to motion of an object. Magnetic, mechanical, gravitational, etc. (See Internal Forces)
Formation Processes	Solidification of magma, cooling of lava, heat and pressure, weathering, erosion, and deposition.
Friction	Resistance to motion between two surfaces.

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G

Geosphere	The inner layer of Earth consisting of the surface all the way to the Earth's core.
Greenhouse Gases	Gases that are contained in our atmosphere such as these natural gases: carbon dioxide, methane, nitrogen oxides and fluorinated gases. These gases let the light come in but trap some of the energy to warm the Earth.
Greenhouse Effect	The collection of greenhouse gases in Earth's atmosphere.

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H

Heating Curve	Graphical representation of correlation between temperature and heat input.
Homeostasis	The body's way of keeping its internal conditions stable and balanced, despite changes in the external environment. (Example: body temperature)
Human Systems	Collection of organs working towards the same means, including digestive, respiratory, circulatory, nervous, and musculoskeletal.
Hydrosphere	The hydrosphere is the part of a planet that's made of water. Oceans, rivers, lakes, and clouds are all typically included.

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I

Igneous Rock	Rocks formed from the cooling and crystallizing of magma.
Internal Forces	Tension, compression, torque, and shear
Inference	A conclusion or plausible explanation based on evidence and prior knowledge.
Inertia	The tendency of an object to remain in its current motion unless acted upon by an outside force.

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J

Joule	Unit of measure for energy also equal to a Newton•metre (N•m)

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K

Kinetic Energy	The energy an object has based on its speed and mass.

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L

Light Cycle	Refers to the cycle of light and darkness a plant receives. Different durations of light and darkness will affect how plants grow, whether they bloom or not, and other elements.
Livestock	Farm animals regarded as an asset

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M

Metamorphic Rock	Rock formed from pre-existing rock from a combination of factors such as heat, pressure, and time.
Mitigation	Reduction of something harmful. Ex: Mitigation Strategies – Reducing the harmful effects of greenhouse gasses.

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N

Natural cyclical events	Includes sun and shadows, moon phases, ocean tides, and seasons; seasonal weather conditions (changes in different locations at different times, cloud cover, temperature, wind direction, and precipitation); weather hazards (thunderstorms, floods, drought conditions, and blizzards); and climate
Natural world	Weather and climate, habitats, plants and animals.
Netukulimk	Concept of taking only what you need and preparing for future generations. Mi'kmaw word.
Newton's Laws	1st Law – an object remains at rest unless acted upon by an unbalanced force. 2nd Law - The acceleration of an object depends on the mass of the object and the amount of force applied. 3rd Law - Whenever one object exerts a force on another object, the second object exerts an equal and opposite on the first
Non-renewable resources	Coil, oil, and natural gas (Fossil fuels)
Nutrient	A substance that provides nourishment essential for growth and the maintenance of life.

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O

Observation	A statement or comment based on using one's senses or assistive technology about the nature of an object.
Organism	Any living thing that has an organized structure, can react to stimuli, reproduce, grow, adapt, and maintain homeostasis.

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P

Photosynthesis	The process by which green plants and some other organisms use sunlight to synthesize foods from carbon dioxide and water. Photosynthesis in plants generally involves the green pigment chlorophyll and generates oxygen as a byproduct.
Physical Properties	Color, weight (mass and volume), density, grain size, texture, temperature, state (solid), conductor, insulators, solubility in water, mixtures, and solutions
Potential Energy	A form of stored energy in an object based on work done to it.
Protected Agriculture	The cultivation of high-value vegetables and other horticultural crops in greenhouses – allows farmers to grow cash crops on small plots in marginal, water-deficient areas where traditional cropping is not viable.

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Q

Qualitative Data	Recorded observations (ie. Yellow in colour, smooth texture)
Quantitative Data	Recorded measurements involving numerical values (ie. 30.0 cm, 15 kg)

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R

Radiation	The transfer of energy as electromagnetic waves or as moving subatomic particles.
Radiant energy	Energy of electromagnetic waves. It is a form of energy that can travel through space.

Respiration (cell respiration)	The process by which individual cells break down food molecules, such as glucose and release energy.
Reflection	When a light ray bounces a smooth surface, mirror-like.
Refraction	Redirection (angle) of a wave (sound, light, etc.) through a medium.
Renewable Energy	Solar, wind, water(hydro), thermal, plants and animals.

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S

Sensory Systems	• Vision (seeing) • Auditory (hearing) • Tactile (touch) • Gustatory (taste) • Olfactory (smell) • Vestibular (sense of balance) • Proprioception (unconscious awareness of position of our body parts.
Seasonal Weather Conditions	Changes in different location at different time: cloud cover, temperature, wind direction, and precipitation
Sedimentary Rock	Rocks formed from pre-existing rocks or other non-living material.
Soil Erosion	Soil erosion is the removal of topsoil, the fertile material vital to life, from the land surface. It is caused by water, wind, rain, and sometimes human activity. It is a natural process that affects all the landforms, but it can be accelerated by some factors.
Soil Profile	A soil profile is a vertical section of the soil from the surface to the parent rock or a depth of at least eight feet. It shows the different horizons or layers that have been formed by soil processes, such as leaching and oxidation. It can be viewed by digging a pit or sampling the soil.
Soil Types	Type of soil refers to the different categories of soil based on their texture, particle size, and composition. The main types of soil are sand, silt, clay, and loam. Other types of soil are derived from the combination of these main types, such as loamy sand, sandy clay, silty clay, etc. Soil can also be classified by its

	color, such as red, black, and brown soil. The properties of each type of soil affect the growth of plants and the stability of structures.
Simple Machine	wheel and axle, pulley, inclined plane, screw, wedge, lever
States of Matter	A distinct form matter can exist in based on atom arrangement, including, solid, liquid, gas, plasma

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T

Temperature	A measure of the average kinetic energy of the particles of a substance.
Thermodynamics	The study of energy, it's transfer into other forms, and interaction with matter.
Trait	A genetically determined characteristic or condition.

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U

Term	Example definition
Term	Example definition

back to top Δ

V

Term	Example definition
Term	Example definition

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W

Wabanaki Peoples	People of the Dawnland and includes Wolastoqey, Mi'kmaq, Penobscot, Peskotomuhkatiyik, and Abenaki. First Nations groups in the province of New Brunswick.
Weather	State of air and atmosphere at a specific location and time.
Weather Hazards	Thunderstorms, floods, drought conditions, blizzards

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X

Term

Term

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Y

Term

Term

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Z

Term

Term

Bibliography

Battiste, Marie (2013). *Decolonizing Education: Nourishing the Learning Spirit.* Vancouver, BC: Purich Publishing.

Gregory , K., Cameron, C., & Davies, A. (2011). *Knowing What Counts: Self-Assessment and Goal Setting 2nd Edition.* Courtenay: Hignell Printing Limited.

Gregory, K., Cameron, C., & Davies, A. (2011). *Making Classroom Assessment Work 3rd Edition .* Courtenay: Hignelle Printing Limited.

Harwell-Kee, K. (2019). Coaching. *The Learning Professional, 40*(4), 66-68.

Marshall, A., Marshall, M., and Iwama, M. *Approaching Mi'kmaq Teachings on the connectiveness of Humans and Nature.* Ecosystem Based Management: Beyond Boundaries. Proceedings of the Sixth International Conference of Science and the Management of Protected Areas. Acadia University, Wolfville, Nova Scotia. 21–26 May 2007.

McTighe, J., & Wiggins, G. (2013). *Essential questions: Opening doors to student understanding.* Association for Supervision & Curriculum Development.

Mi'kmawey Debert Cultural Centre (2015). *Mi'kmawe'l Tan Teli-kina'muemk: Teaching about the Mi'kmaq.* Tim Bernard, Leah Morine Rosenmeier and Sharon L. Farrell (Eds.). Truro, Nova Scotia: Eastern Woodland Print Communications. Retrieved on July 20, 2021 from https://www.mikmaweydebert.ca/sharing-our-stories/education-and-outreach/school-curriculum/

Restoule, J-P. (2019). Indigenous Education Resources. University of Toronto - Ontario Institute for Studies in Education: Toronto, ON. Retrieved on July 20, 2021, from https://www.oise.utoronto.ca/abed101/indigenous-ways-of-knowing/

Restoule, J-P. (2019). Understanding Indigenous Perspectives. University of Toronto - Ontario Institute for Studies in Education: Toronto, ON. Retrieved on July 20, 2021, from https://www.oise.utoronto.ca/abed101/

Sharifi, A., Ghanizadeh, A., & Jahedizadeh, S. (2017). The effects of simulation on middle school students' perceptions of classroom activities and their foreign language achievement: A mixed methods approach. *International Electronic Journal of Elementary Education, 9*(3), 667-680.

Smith, L. T. (2012). *Decolonizing Methodologies: Research and Indigenous Peoples. 2nd Edition*, London, UK: Zed Books Ltd.

White, J. M. (2018). Improving museum field trips' contributions to experiential education for STEM disciplines. *North American Colleges and Teachers of Agriculture Journal, 62*(2), 104-114.