Long Range Model 1 - Grade 4

STRAND A: STEM Skills and Connections	 A1.1 Scientific Research	 A1.2 Scientific Experimentation	 A1.3 Engineering Design	 A1.4 Safety	 A1.5 Communication	 A2. Coding and Emerging Technologies	 A3. Applications Connections and Contributions
	A1. STEM Investigation and Communication Skills: use a scientific research process, a scientific experimentation process, and an engineering design process to conduct investigations, following appropriate health and safety procedures  A1.1 use a scientific research process and associated skills to conduct investigations  A1.2 use a scientific experimentation process and associated skills to conduct investigations  A1.3 use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems  A1.4 follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials  A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes  **A2. Coding and Emerging Technologies:** use coding in investigations and to model concepts, and assess the impact of coding and of emerging technologies on everyday life A2.1 write and execute code in investigations and when modelling concepts, with a focus on creating clear and precise instructions for simple algorithms A2.2 identify and describe impacts of coding and of emerging technologies on everyday life  **A3. Applications, Connections, and Contributions:** demonstrate an understanding of the practical applications of science and technology, and of contributions to science and technology from people with diverse lived experiences A3.1 describe practical applications of science and technology concepts in their home and community, and how these applications address real-world problems A3.2 investigate how science and technology can be used with other subject areas to address real-world problems A3.3 analyse contributions to science and technology from various communities						

Term 1 - Overview, Guidelines, Assessment ideas

In term one students will explore impacts of humans on habitats and their communities and how to minimize these impacts (Strand B). They will also explore lights and sounds in relation to innovations in our changing world and their properties and characteristics (Strand C). Connections to Strand D (Machines and their Mechanisms) as well as Strand E (Rocks and Minerals) will also be explored.

When planning for your assessments, consider the STEM skills such as student observations, predictions, revisions of designs, and communication through coding in Strand A.

Inquiry and curiosity are important characteristics to foster in any learning environment. Engagement and motivation increase when students are encouraged to explore curriculum content in ways that are meaningful to them.

Creating a learning environment in which students feel safe, supported, and valued will help them voice their questions and ideas. There are many ways that educators can create such an environment, including

- Honoring students' background knowledge and inviting them to share what they know
- Becoming a co-learner with students when uncovering content guided by students' wonderings
- Encouraging students to ask good questions, and allowing them to find answers and/or solutions
- Supporting students as they carry out the scientific and engineering processes

Reflective Questions when Planning:

- What expectations are assumed for other expectations to be addressed?
- How might I revisit expectations at various times throughout the year?
- How can I create opportunities for students to continue to practise and consolidate learning when they are engaged in new learning?
- How will I use formative assessment to guide daily lessons?
- What materials, tools, and resources will be needed for each unit?

Month or Suggested Timelines	Big Ideas and Guiding Questions for an Inquiry Stance	STEM Skills and Connections (Strand A)	Strands and Expectations	Cross-Curricular Integrations	Resources
September	**Guiding question:** What do animals and plants need to survive? My digital pet/Plants and Animals in their Environment Through this engaging month of activities that allow frequent	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community. **A1.2** Observation journal - animals, plants. What are their needs? How is the environment, a seemingly passive place, able to meet those needs?	**B1.1** assess positive and negative impacts of human activities on habitats and communities, while taking different perspectives into account **B1.2** analyse the impact of the depletion or extinction of a species on its habitat	**Mathematics** Counting and estimating the number of objects and animals during an observation period (eg. 45 ants).	**First Steps**: STAO Safety in Elementary Science and Technology Classroom This unit invites outdoor education and further consideration could be given to inclement weather, using

	comparison of living organisms' needs and those of our digital pets, students build knowledge of species' needs and aspects of their environment which fulfill those needs. Activities can include coding a digital pet on a microcontroller or free online emulated microcontroller (the needs are determined by the coder), frequent outings to the school yard to discover, inventory, and evaluate the needs of plants and animals in the local environment, and a culminating event such as a field trip to a wildlife refuge, city park or conservation site and the choice of a species of plant or animal which is found in one of the places visited.	 **A1.5** Communicating with visuals and words in the science journal  **A1.3**, **A1.5** Begin by coding a simple program that allows a microcontroller or virtual microcontroller emulator to be transformed into a digital pet. Students can choose a single need in their code and create a digital response when the coded need is met. Examples proposed to students could include that when the microcontroller is handled and moved, the microcontroller has a corresponding positive response (emulating mammals need to interact with family members or members of their species).  **A1.1** Once animals and plants in our environment are identified (ants, worms, robins, squirrels) research can be done to name the animals and find basic facts. Additional research on our identified animal friends will continue through the year. A picture of each animal can be posted in class, and information can be added later.  **A1.4**	and community, and describe possible actions to prevent such depletions or extinctions **B2.1** describe habitats as areas that provide organisms, including plants and animals, with the necessities of life, and identify ways in which a local habitat provides these necessities **B2.2** describe a community as a group of interacting species sharing a common habitat, and identify factors that affect the ability of a community of plants and animals to survive in a local habitat **B2.3** describe the relationship of organisms in a food chain, and classify organisms as producers, consumers, or decomposers **B2.4** demonstrate an understanding of a food web as the interconnection of multiple food chains in a natural community	**Health and Physical Education** Walking and exploring safely the outdoor spaces that surround us. **Language** Communicating written form in the science journal and orally to the teacher and the class. Reading about habitats. Media works and writing activities can be completed during the Save the Pollinator Project and Canadian Species at Risk Projects, as well as in the Social Studies connection projects. **Social Studies** (A - Heritage and Identity B - People and Environments) **Organic Farming Study:** Students investigate	the buddy system, and not eating delicious-looking berries without consulting an expert/additional outdoor Health and Safety Procedures. Outdoor education essentials also include asking students to bring in umbrellas, clipboards, and notebooks or collecting these items for use outside. Collection of materials for building projects is essential, and other objects such as cue cards, string, boxes, craft materials, pipe cleaners, and other materials such as recyclables for makerspace-type activities are important to consider. For construction, consideration may be given to collecting and/or purchasing glue guns, wood glue, balsa wood, and small saws Teachers should locate a simple table for the identification of species and their corresponding needs. Free Block coding projects suggested by Makecode,

		Safety rules when visiting and observing nature. Respecting nature, not disturbing ecosystems, washing hands, etc. See notes in resources.  **A1.1** **Food Chains and Webs:** Students create mobile food chains using cue cards and string to show the connections between producers, consumers, and decomposers, as well as herbivores, omnivores, and carnivores; students then connect their chain to another chain from the same habitat and create a food web  **A1.3** **Pollinator Project**: Students study the role of local pollinators (butterflies, moths, bees, birds); create food chains including pollinators; design bees using craft/recycled objects with pipe cleaner legs to dip into crushed cheezies or powder that transfer the powder to crafted flowers; design a pollinator garden that could be implemented at school or build as models, take specific needs of pollinators into account for the designed habitat; discuss Health and Safety Procedures surrounding pollinators (bees) and appropriate strategies of dealing with bees; communicate with the school community by creating posters of	**A2.1** write and execute code in investigations and when modelling concepts, with a focus on producing different types of output for a variety of purposes	issues related to herbicide and pesticide use and how organic farming practices are an example of a practical solution; students study past farming practices from First Nations, Inuit, and Metis as well as other early civilizations to compare them to organic farming (Social Studies A and B) **UN Sustainability Goals Connections Projects** Students choose to study real world problems and solutions, such as organic farming, habitat restoration projects, Ontario Species At Risk Act, etc. and investigate how the current UN Sustainability Goals were dealt with by past civilizations, First Nations, Inuit, and Metis, and how current Canadian Government Policies deal with sustainability (Social	Scratch, or Codebug **Next Steps:** Resources to support outdoor learning and opportunities for teacher training. *Project Wild* by Canadian Wildlife Federation. Action Project funding opportunities with resources for outdoor learning and UN Sustainability goals. Learning for a Sustainable Future STEM Learning Challenges year-long activities and resources. *STEM at School* by Let's Talk Science STEM kits and other supplies can be found at ● Kidder Canada ● Flinn Scientific Canada Invite a conservation Officer into class to talk with students to discuss the management and relationship between different plant and animal species.

		pollinators using student findings - *this can be continued over a longer period of time*  **A1.3** **Canadian Species at Risk Projects:** Students study and research the needs and habitats of a Canadian Species at Risk and design/build dioramas of its food chains in its habitat; students identify factors contributing to the decline of the species and design possible solutions to those problems (e.g. animal road crossings, plastic collectors in rivers, etc.); students communicate their findings by displaying dioramas and models of their solutions.		Studies A and B) **Canadian Environmental Heroes study** Students create a digital or paper display that highlights important contributions of Canadian environmentalists or organizations (e.g. David Suzuki, WWF, etc.)	If available, invite an elder to come into the classroom to explain which animals are hunted for food, clothing, or tools. Other great lesson plans about sustainability and habitats can be found in The World's Largest Lesson Resources section - link here: Resources | The World's Largest Lesson. Visit an outdoor education centre or conservation centre if possible. Invite a local guest speaker to talk about habitats and animals. If possible, invite a beekeeper in to talk to students about the skilled trade of beekeeping.
October	**What is a habitat? Can dirt or soil be a habitat?** Armed with spoons or garden tools students try to find living things in the dirt in sections of the schoolyard. Why is garbage a problem in our world?	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.  **A1.3** Create an indoor composting bin with earthworms to demonstrate the	**B1.1** assess positive and negative impacts of human activities on habitats and communities while taking different perspectives into account **B2.3** describe the relationship of organisms	**Social Studies:** **Indigenous connection** Observations of changes over seasons and years as crucial to the Indigenous way of knowing. Connect and	**First Steps**: Collect materials for building projects and supplies for the compost bin and habitat dioramas, as well as recyclables for makerspace-type activities, are important to consider.

	How much food waste does the school throw out in a week? How much food waste could an earthworm transform in a school year? Is an earthworm a carnivore, an herbivore, or omnivore, or none of the above? How do different habitats meet the requirements of different types of plants and animals? How is soil used in our environment and/or daily lives? (e.g., soils that help drainage around the house, septic bed, drinking water filters). How does soil clean water? What might that mean about the use of each soil type? Where might you observe different types of soils? What living things can live in this type of soil? How do terrariums, school gardens, and home gardens provide shelter and/or nutrients for different kinds of living things?	interdependence of living things. Make predictions of what items will compost quickly, which will never compost, and everything in between. Evaluate and monitor the positive reduction of the amount of food waste throughout the year as a result of composting with the bin and others in the school, if available.  **A.2** **Design a Habitat** Using free online CAD software and optional 3D printing technology or a 3d generated world through a 3d cube game, students design and create a naturalization area to enhance the habitat for a chosen Canadian species at risk.  **A1.1, A1.3, A1.4, A1.5, A.3** **Rock Garden Project** Students design and build a rock garden in the schoolyard or the classroom; students investigate which types of plants do well in a rock garden and how plants use soil to grow; students share what they have learned by taking pictures of their garden and creating a media display showcasing the rocks and plants they chose	in a food chain, and classify organisms as producers, consumers, or decomposers **B2.5** describe how animals are categorized according to their diet, and categorize various animals as carnivores, herbivores, or omnivores **B2.6** describe structural adaptations of a variety of plants and animals and how these adaptations allow the organisms to survive in specific habitats **B2.7** explain why all habitats have limits to the number of plants and animals they can support **A3.2** investigate how science and technology can be used with other subject areas to address real-world problems **E1.1** analyse ways in which geological processes impact society and the environment **E2.4** describe everyday	build relationships with local communities and knowledge keepers to learn more about nature in your community. **Mathematics** Students use measurement devices for collecting data on trees. Students also tally animals and plants when walking in the schoolyard and/or community. **Language** Students can read about habitats by doing research as well as by providing books about habitats in the classroom. Students write and create media works as well as using oral communication when completing the various projects included in this unit plan. **Health and Physical Education** Students go outside for	This unit can also be completed in the spring/summer - if wanting to plant a garden or tree, students can plan in the fall and plant later. Some trees and plants such as garlic or other bulbs such as tulips or daffodils can be planted in the fall for spring harvest. **Next Steps:** Information on how to sign up with Ecoschools Canada can be found here. There are resources for waste audits, habitat and garden activities, etc.

		A1.3, A1.4 **Habitat Dioramas** Students learn about the habitats of animals they choose by constructing dioramas of their animal's habitats using recycled materials, boxes, construction paper, craft materials, etc.; students construct a poster that goes with their diorama to explain their habitat including the food web in it **A1.3, A1.4** **Tree Study** Students choose a tree in their schoolyard or community. They take pictures of it in fall, winter, and spring, and collect data on it such as its approximate height (use thumb rule), the number of leaves, approximate age (using circumference), and any wildlife living on or near it. Students research why trees are an important habitat and present what they have learned about their tree in media works to the school community. Students may also want to get involved in planting a tree in their schoolyard if possible or creating a habitat including a tree as a garden area as an action project.	uses of rocks and minerals	a small walk around their schoolyard, or nearby park. Students can explore and identify the habitats they discover and create a tally of their findings of plant and animal species in each habitat. Students can play a game of Freeze Tag while acting as their favorite species. Students can play the 'Predator and Prey' game -in which they find or create game cards describing what various animals eat and need to find another animal to eat.	
November	**Experiment with Sounds:** What is a sound? Why do we hear sounds?	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.	**C2.4** describe properties of sound, including that sound travels through a medium as a wave and that sound can be	**Language** Communicating a sequence of events through coding	**First Steps**: Collect materials such as tuning forks, salt, paper cups, string, recyclables,

	Have you noticed what happens to the sound of a car as it drives by at high speed or the sound of a low-flying plane as it flies by? Have you noticed what happens when a person yells at you or hits a baseball from across a field? Have you seen lightning and then heard thunder afterward? Can you explain why you hear the sound of a train or plane passing after it has already gone by? Find a quiet place and stay still and silent to experience the sounds for five minutes. Use a video or audio recording app to capture the sounds. How do you think the sounds are created? Return to the same space at a different time or on a different day. How did the sounds change?	 **A1.2** Experiment: Students choose any object which can vibrate to create sounds. Slow-motion videos of those vibrations (function available on any phone) can enhance the visual effect of the vibration.  **A.2** Coding sounds (e.g., morse code) or music. Many microcontrollers contain integrated speakers. Piezo buzzers can be connected. Old recycled external speakers can also be made to function with a simple connection to a microcontroller. Without a microcontroller, emulators or block coding programs can produce the same effect through emulation.  **A1.2, A1.4** **Tuning Forks and Water/Salt** Students investigate how sound moves in waves by striking a tuning fork and placing it in a cup of water or on a plate with salt on it, and record observations.  **A1.1, A1.2, A1.4** **Cup Phones** Students learn about sound waves by connecting 2 paper cups with a string and taking turns listening and talking	absorbed or reflected and modified **C2.5** explain how vibrations cause sound waves **C2.8** identify sensory organs and devices that make use of the properties of light and sounds	**Social Studies:** **Soundproofing Inquiry** Students research sound pollution and damage to ears caused by loud sounds; students design, build and test a soundproof box that will muffle sounds; students communicate their findings with posters and displays of what they have learned (People and Environments B) **Music** Students create instruments and play together to share a song **Language** Students can read about sound and when they research. Students can be provided with books about sound to read. Students write, create media works, and use oral communication	makerspace items, etc. before starting this unit. Teachers may also want to ensure that their school has adequate supplies of pulleys and/or gears to use for experiments. Sets can be found at Kidder.ca. Spools can be substituted for pulleys as well. Gears can also be made from cardboard, and templates can be found online. Find coding activities such as Scratch to create music using code. Some other sites include Tynker and Dance Party on Code.org. Here is a lesson plan for making music in Scratch. **Next Steps:** How would a sound engineer use the properties of materials to design a live theatre or a movie theatre? Invite a sound engineer in to discuss. STEM Learning Challenges year-long activities and resources

		into it in pairs. Students research parts of the ear and explain how the cups allowed them to hear using parts of the ear in their explanation.  **A1.3, A1.4, A1.5** **Musical Instrument Inquiry Project** Students research how to design and build drums, guitars, and other simple instruments using recycled or other approved materials; students design, build and test a simple instrument that will play a song; students can share their instruments by recording themselves or creating a class show.		when completing STEM projects and experiments.	*STEM at School* by Let's Talk Science STEM kits and other supplies can be found at • Kidder Canada • Flinn Scientific Canada If possible, invite a Piano Tuner to share his/her expertise in that skilled trade and/or invite an electrician to share his/her expertise in lighting.
December	**Experiment with light** Can sources of light be both natural and artificial? Can sources of light emit heat and others do not? The northern lights or Aurora Borealis are a magnificent light display visible in the northern regions of Ontario. What kind of light are they? How do our eyes sense and respond to light? How do optometrists use tools to see the different components of our vision? Do you have to point a remote directly at an electronic device to	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.  **A1.4** Experiment: Flashlight beams through water  **A1.1** Observation: Dimming the lights in the classroom, students observe the number of sources of light that can be seen.	**C1.1** assess the impacts on society of devices that use the properties of light or sound, or both **C1.2** assess the impacts on the environment of light energy and sound energy produced by various technologies while taking different perspectives into account **C2.1** identify a variety of natural and artificial light sources **C2.2** distinguish between objects and living things	**Language:** Students can read books about light and sound. Students write, create media works, and use oral communication when completing STEM projects and experiments.	**First Steps**: Collect materials such as prisms, metal spoons, flashlights, mirrors, etc. before starting this unit. Consider collecting milk cartons to make the periscopes, as well as other recyclable or found materials for making the musical instruments. A UV garden would be a great asset if doing the plants project with light.

	activate it? What does this mean? What is the difference in the light we receive on Earth between the moon and the Sun?	 **A1.1** The same observation exercise can be repeated in students' neighbourhoods by taking a picture and sharing it with the class. Students may observe the utility of light standards, car lights for communication by signals, lights at the door of homes, and a host of unpredictable lights which serve a useful purpose.  **A1.4** **Light and Plants Inquiry** Students investigate why plants need light to grow; students design and conduct experiments to test if UV gardens or other light sources will stimulate plant growth versus sunlit areas; describe the difference between natural light and light sources that emit heat versus those light sources that do not emit heat and how those differences can affect plant growth.  **A1.2, A1.4** **Prisms and Spoons Investigation** Students use prisms and metal spoons (or other school materials) to explore how sunlight and artificial light travels. Students share what they have learned by drawing diagrams of their observations.	that emit their own light and those that reflect light from other sources **C2.3** describe properties of light, including that light travels in a straight path and that light can be absorbed, reflected, and refracted **C2.6** describe how different objects and materials interact with light and sound energy **C2.7** distinguish between sources of light that emit both light and heat and those that emit light but little heat **C2.8** identify sensory organs and devices that make use of the properties of light and sound		

		A1.1, A1.3, A1.4 **Build a periscope or kaleidoscope** Students research the uses of mirrors in periscopes, telescopes, kaleidoscopes, and microscopes; students design, build, and test a milk carton periscope or kaleidoscope following proper safety procedures; students draw the path of light as it goes through the periscope or kaleidoscope into their eyes and research/explain how the light goes into their eyes and into their brains; describe the differences between objects that make their own light and those that reflect light **A1.4** Health and Safety procedures with light. When can beams of light damage your eyes? What about the sun? Why do people wear sunglasses?			
January	**Sound and light with a purpose** Through a series of inquiries, students discover various inventions related to light or sound which improve some aspects of our lives. What is an LED? What is an LED screen? What is an LCD screen? How do these inventions work? What is the difference between an incandescent light bulb and an led	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community. **A.2** **Code a Song with Light Show** Students use a block-based code platform like Scratch to code a song of their creation that has a visual representation to go with it.	**C1.1** assess the impacts on society of devices that use the properties of light or sound, or both **C1.2** assess the impacts on the environment of light energy and sound energy produced by various technologies, while taking different perspectives into account	**Language** Communicating observations, predictions, and conclusions. **First Nations, Metis, Inuit, and Early Civilizations Sound and Light Investigation:** Students research how	**First Steps**: Collect materials such as pulleys, gears, recyclables, makerspace items, etc. before starting this unit. **Next Steps:** Students start a Lights Off Campaign at their school to help with energy conservation

	light bulb? What is sound and light pollution and how does it affect living things? How do machines that make sounds and lights affect living things? How do sound and light detectors help improve the lives of people who have hearing or vision challenges? What might you invent to help further? Laws have been made and fines increased for texting and driving, yet statistics show it is still on the rise. What can be done to reduce this?	 **A1.1** **Animal Senses** Students research how various animals such as bees and dogs see and hear differently (different pitches, different spectra) and how these adaptations help them survive and find food. Students prepare a media work with their findings such as a poster or multimedia presentation.  **A1.1** **Light and Sound in Cities:** Students explore how light and sound pollution in cities affects animals living in and around cities. Students produce a report either digitally, coded, or written with their findings and share it with their classmates.  **A1.3** Engineering option: design a solution to address light pollution (e.g., better lampposts, or coding lights that turn on and off).  **A1.2, A1.3, A1.4** **Find Your Blind Spot Activity** Students find their blind spot.	**C2.6** describe how different objects and materials interact with light and sound energy **B1.1** assess positive and negative impacts of human activities on habitats and communities, while taking different perspectives into account **B1.2** analyse the impact of the depletion or extinction of a species on its habitat and community, and describe possible actions to prevent such depletions or extinctions **B2.1** describe habitats as areas that provide organisms, including plants and animals, with the necessities of life, and identify ways in which a local habitat provides these necessities **B2.2** describe a community as a group of interacting species sharing a common habitat, and identify factors that affect the ability of a community of plants and animals to	First Nations, Metis, and Inuit used light and sound devices to communicate (e.g. drums), and how other early civilizations used similar communication devices; students describe how First Nations, Metis, Inuit and other early civilizations created light and sound devices that we still use today (examples: drums and other instruments invented and used, ‘qulliq’ - Inuit lamp, Dendera light bulb from Ancient Egypt) (Social Studies Heritage and Identity (A) and People and Environments (B) **Mathematics:** Students use math concepts such as measurement and data collection in the STEM experiments.	and do an energy audit in their school. Check out Canada Ecoschools for resources.

		A1.2, A1.3, A1.4 **Eye Protection Activity** Students investigate ways to protect their eyes. See 'Resources' for a link for a lesson plan.	survive in a local habitat		

Term 2 - Guidelines, Assessment ideas

In term two, students will discover Machines and Mechanisms (Strand D) and assess the social and environmental impacts of geological processes and of human uses of Rocks, Minerals and Geological Processes (Strand E) Spiralling back to Habitats (Strand B) from Term 1 students use composted earth to create a vegetable garden. Students will also explore connections between Light and Sound (Strand C) as well.
When planning for your assessments, consider the STEM skills such as student observations, predictions, revisions of designs, and communication through coding in Strand A. Inquiry and curiosity are important characteristics to foster in any learning environment. Engagement and motivation increase when students are encouraged to explore curriculum content in ways that are meaningful to them.
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- What materials, tools, and resources will be needed for each unit?

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February	**Machines and Mechanisms, Rocks, Minerals, and Geological Processes**	**NOTE:** Teachers should choose from this list of STEM activities that best suit their students, school, and community.	**D1.1** assess the impacts of machines and their mechanisms on the daily lives of people in various	**Ancient Buildings Investigation:** Students choose a famous building from	**First Steps**: Collected items such as paper cups, cardboard,

	What were some of the first historical uses for Machines and mechanisms and other simple machines? In what ways have the resources in our community and ancient civilizations changed over time?	 **A1.2, A1.3, A1.4** How were the Great Pyramids built? A good example of the usefulness of machines and of the utility of rocks is explored. Students use STEM building materials to build a pyramid, by using such items as paper cups, cardboard, marshmallows, and toothpicks.  **A1.2, A1.3, A1.4** **Wind Power Inquiry** Students research windmills and wind turbines as well as the basics of pulleys and gear trains; students design, build and test a machine that uses wind power to lift an object 1 metre using simple machines; students communicate how their wind machine works and describe how the simple machines were used to harness the energy of the wind; students discuss the effects that machines can make with regards to sounds that can cause sound pollution and damage to hearing.	communities **D1.2** assess and compare the environmental impacts of using different machines designed for similar purposes **D2.3** describe how different mechanisms transmit various types of motion, including rotary motion, from one system to another **E2.4** describe everyday uses of rocks and minerals **E2.6** demonstrate an understanding of First Nations, Métis, and Inuit geological knowledges that are used in the selection of different rocks and minerals for specific purposes	an ancient civilization such as the Great Pyramids, Machu Picchu, Great Wall of China, The Acropolis, etc. and find interesting facts about how it was built, why it was built, and how rocks and minerals were used in the process. **Inukshuks Investigation** Students research what inukshuks are, their traditional uses, and their current uses. Students build their own inukshuks using rocks. If possible, invite a small engine repair technician to share his/her expertise.	marshmallows, gears, pulleys, etc. before starting this unit. Teachers may also want to ensure that their school has adequate supplies of pulleys and/or gears to use for experiments. Sets can be found at Kidder.ca. Spools can be substituted for pulleys as well. Gears can also be made from cardboard, and templates can be found online.

March	**Movement - Machines and Mechanisms** Machines help humans move themselves and move loads. Students explore the machines that exist in our world and their impact on our environment How can the gears and pulley systems in amusement park attractions change the speed or direction of the ride? How does a bicycle use Machines and mechanisms to make it easier to travel uphill? What do you think the purpose of the gears inside this toy is? What might they look like?	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.  **A1.1** **Machines Treasure Hunt** Students explore their classroom, school, and schoolyard looking for simple machines such as pulleys, gears, levers, etc. Students tally their findings and compare what they observe. Students explore simple machines that the teacher provides such as a stapler, kids toys, pulley, and gear pieces from a kit if possible, and research/describe how each part works.  **A1.2, A1.3, A1.4** **Gear and Pulley Explorations** Students use pre-made or cut-out gears to investigate rotation speed and direction; students use a variety of pulleys to investigate how pulleys are used to lift objects and transfer forces.  **A1.3** Build machines: model playgrounds or amusement parks. Design: the machines of the future.	**D1.1** assess the impacts of machines and their mechanisms on the daily lives of people in various communities **D1.2** assess and compare the environmental impacts of using different machines designed for similar purposes **D2.1** identify machines that are used in daily life, and describe their purposes **D2.2** identify the parts of various mechanisms and describe the purpose of each part **D2.3** describe how different mechanisms transmit various types of motion, including rotary motion, from one system to another **D2.4** describe how mechanisms transform motion, including how they can change the geometric plane in which the motion occurs and the speed and/or direction of motion	**Language** Students create a comic to outline and explain the steps involved in their Rube Goldberg Machine (hand-drawn or digital). **Bikes Around the World Inquiry** Students research how bikes use gears, bike use around the world, and the evolution of the bicycle; students compare the bicycle to other modes of human-powered transportation used by early First Nations, Inuit, Metis, and other early civilizations; students participate in raising awareness of the issues related to pros and cons of human-powered transport by communicating their learning in various media forms. **Pulleys and Gears - Past, Present and Future Inquiry** Students research the uses of pulleys, gears,	**First Steps**: STEM Learning Challenges year-long activities and resources *STEM at School* by Let's Talk Science STEM kits and other supplies can be found at ● Kidder Canada ● Flinn Scientific Canada Teachers should collect items for STEM challenges such as paper, treasure hunt items, and building materials for the Rube Goldberg machines.

		 **A1.5** Communicate the results of their experiments and their designs to others.  **A1.3, A.2** **Rube Goldberg Machines** Students design, build, and test their own 3-5 step Rube Goldberg machine based on their own cartoon. Students can animate their description using coding software  **A1.4** Health and Safety Procedures when using building tools such as scissors, adhesives, cardboard, screwdrivers, hammer, etc.  **A1.2, A1.3, A1.4** **Mechanical Arm Activity** Students research how mechanical arms, like the Canadarm, work; they design, build and test a mechanical arm using pulleys, gears, and simple machines that will pick up and move an object; students communicate their understanding by drawing and labelling the parts of their arm and describe how their arm could benefit someone.	**D2.5** explain how forces are changed in a variety of machines	and other simple machines in early First Nations, Inuit, Metis, and other early civilizations (e.g. drawbridge, Cowichan spindle whorl) and compare the early uses to machines using simple machines today (e.g. cranes, electric screwdrivers, watches); students describe how simple machines are still used to make work more efficient; students choose a current issue that could be solved by designing a machine to help with that issue (e.g. environmental, human health, construction on the Moon/Mars) **Mathematics** Students use measurement and collect data through tallies.	

April	**Rocks, Minerals, and Geological Processes:** What are the differences between the different types of rocks? What is the rock cycle? How are fossils formed? What can we learn from fossils? **Planning and preparing a vegetable garden with composted earth:** Is a vegetable garden an important habitat? Which plants can grow in our environment? What can we do to enhance the growth of our garden?	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.  **A1.2** **Light and Plants Inquiry:** Students use the UV garden or a sunlit area to start plants for their vegetable garden or just to investigate how plants grow and need light. Students can experiment by using different types of soil, no soil (hydroponics), and different amounts of sunlight or UV light to see how the plants are affected.  **A1.2** **Sort, Classify, and Re-sort Activity** Students sort a variety of rocks according to their own sorting method and explain their methods to each other. Students research and identify the rock samples using common characteristics, as well as other methods such as scratch tests. They can then re-sort their rocks using common characteristics (igneous, metamorphic, and sedimentary).  **A1.2** **Growing Crystals Activity** Students research crystal formation in various types of rocks. Students grow	**B2.1** describe habitats as areas that provide organisms, including plants and animals, with the necessities of life, and identify ways in which a local habitat provides these necessities **B2.2** describe a community as a group of interacting species sharing a common habitat, and identify factors that affect the ability of a community of plants and animals to survive in a local habitat **E2.1** explain geological processes that result in the formation of igneous, sedimentary, and metamorphic rocks, using the rock cycle **E2.2** describe the physical properties of igneous, sedimentary, and metamorphic rocks **E2.3** classify different rocks and minerals according to their composition and physical properties, using various	**Language:** Students read about rocks and minerals when researching and also in books that are provided. **Rock Cycle Comics** Students create a comic strip showing the rock cycle and the process by which rocks change form using speech bubbles to describe each stage; students can use a coding platform like Scratch to create their comic or use paper; students share their comics with their classmates (Reading, Writing, Oral Communication, Media) **Pet Rock Project** Students find a special rock and build it a home using found objects; students write stories about their pet rocks and adventures their rocks have with other pet rocks; students read each	**First Steps**: Ask students to bring in rock samples safely to school and start collecting samples of sedimentary, igneous, and metamorphic rocks if possible or check to see if your school has some rock collections to use. Check also for rock testing items such as scratch test plates. Fossil kits may also be available. Outdoor education can be included easily in this unit. Your class can go for walks around the schoolyard and community to look for types of rocks and how rocks are used in buildings. Collecting items such as salt, sugar, glass bottles, recyclable plastics and aluminum foil items, sand, beans, cardboard, and other makerspace items is encouraged. The Make Your Own Fossil activity needs items like coffee grounds, coffee, flour, and parchment or waxed paper. **Next Steps:**

		crystals using a variety of methods and compare results (e.g., sugar crystals versus salt crystals). Students communicate their results by displaying results as a media work  A1.1, A1.5 **Fossil and Rock Hunt** Students walk around the schoolyard or community and keep a tally of the different types of rocks or fossils they find. Students also look for uses of rocks or minerals in their school, schoolyard, or community and document what they notice. Students discuss their findings and write down their observations  **A1.2, A1.4** **Make Your Own Fossils** Students make their own fossils by pressing items to 'fossilize' (e.g., leaves, flower petals, tree bark) into homemade playdough. Students investigate how fossils are made and what we can learn from them.	tests and criteria **E2.4** describe everyday uses of rocks and minerals **E2.5** describe how fossils are formed and what information they can provide about Earth's history	other's stories; students can also create their stories using block coding such as Scratch or making comics or digital stories (Reading, Writing, Oral Communication, Media) **Math** Students use math during tallies to collect and analyse data. Students use area and volume concepts when planning and building their vegetable garden.	Visit a rock quarry if possible. Earth Month activities and initiatives such as yard cleanups, waste reduction challenges, and Earth Day activities can be implemented. Check out the website at Earth Day Canada for more ideas: Suggestions of activities Earth Day Canada Other lesson plans about sustainability and energy can be found at The World's Largest Lesson Invite a rock collector to share his/her collection. Invite a gemologist, jeweller, or miner to share their expertise in their skilled trades.
May	Mining and other issues related to resource extraction How can we preserve natural resources? What is our responsibility to the environment?	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.  **A1.1**	**E1.1** analyse ways in which geological processes impact society and the environment **E1.2** assess social and environmental impacts of extracting and refining	**Social Studies:** Students research issues related to mining and extraction of resources, examples: tailings and water pollution related to mining, habitat	**First Steps**: Teachers will need to collect items for the various STEM activities such as makerspace items for building, sand, beans, and recyclable items as well.

	How do different types of technology for mining affect the environment? What can we do to help conserve mineral resources and protect habitats? How are sound and light technologies used to find mineral deposits and specimens?	**Rocks, lights, and sound waves Investigation** Students research how light and sound technologies are used to identify and locate mineral specimens and resources; for example, how sound wave technology is used to find diamond deposits and how some rocks emit fluorescence when observed under blue light. Students share their findings.  **A1.2, A1.3, A1.4** **Mining for Rocks** Students design, build, and test a device that will lift a rock 1m using pulleys, gears, or other simple machines. Students also research how mining machines use pulleys and gears to extract minerals, and how those machines impact the environment around them.  **A1.2, A1.3, A1.4** **Can You Dig It Inquiry** Students extract a resource by 'mining for beans' in a container of sand. They design, build and test a method for extraction with the least amount of contamination to the resource, the least use of other resources, and the least waste. Students research the use of metals in our everyday lives and where those metals can be found in Canada	rocks and minerals and of manufacturing, recycling, and disposing of products derived from rocks and minerals, while taking various perspectives into account **D1.1** assess the impacts of machines and their mechanisms on the daily lives of people in various communities **D1.2** assess and compare the environmental impacts of using different machines designed for similar purposes **C2.3** describe properties of light, including that light travels in a straight path and that light can be absorbed, reflected, and refracted **C2.4** describe properties of sound, including that sound travels through a medium as a wave and that sound can be absorbed or reflected and modified **C2.5** explain how	destruction, and deforestation related to mining, etc. **Language:** Students debate the pros and cons of mining in a debate format or by writing a report stating the student's opinion with facts to back up his/her opinion.	Websites to check out for mining resources: Mining Matters Activity: The Most Delicious Mine | Royal Ontario Museum

		and the world, how they are extracted, and issues surrounding their extraction (e.g. mining tailings, etc). Students examine traditional uses of metals by First Nations, Metis, Inuit, and other early civilizations, and how they extracted the metals. Students propose solutions and design possible technologies to limit pollution from mining.  **A1.3, A1.4** **The Most Delicious Mine Activity** See the Resources column for this lesson plan.	vibrations cause sound waves **C2.6** describe how different objects and materials interact with light and sound energy **B1.1** assess positive and negative impacts of human activities on habitats and communities while taking different perspectives into account		
June	**Taking care of the environment and using what we have learned** How can we use what we have learned about rocks and minerals to help us with resource conservation? How can we use what we have learned about habitats to build habitats for animals? How can we use what we have learned about machines to help us repurpose items and make new uses for them rather than putting them in landfills? How can we use what we have	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.  **A1.2, A1.3, A1.4** **Recycle or Reuse Inquiry** Students collect various recyclable items and repurpose them (design, build and test). Students investigate the pros and cons of reusing/repurposing items versus recycling them (e.g. cost factors). Students investigate the effectiveness of collection programs for aluminum, glass, and plastic bottles, as well as other solutions such as using plant-based alternatives for packaging. Students create media works to	**B2.1** describe habitats as areas that provide organisms, including plants and animals, with the necessities of life, and identify ways in which a local habitat provides these necessities **B2.2** describe a community as a group of interacting species sharing a common habitat, and identify factors that affect the ability of a community of plants and animals to survive in a local habitat	**Language** Students read and write about issues of interest to them about the topics they have learned this year. Students write letters to their local member of government about an issue they have learned about this year that the government can get involved with helping. **Mathematics** Students use measurement and	**First Steps**: Teachers will need to collect various items such as recycling for repurposing, cans, and bottles for the STEM investigation, and equipment/materials for building the bee houses if possible. **Next Steps:** Other lesson plans about sustainability and energy can be found at The World's Largest Lesson

	learned to keep ourselves and our environment safer from light and sound issues?	communicate their research findings and their repurposed items. Students organize and set up a collection program at their school, such as collecting aluminum cans to donate funds to a local charity.  **A1.1, A1.2, A1.4, A1.5** **Cans and Bottles Investigation** Students research how pop cans and pop bottles are manufactured. Students research the process of how cans and bottles can be recycled into new ones. Students perform experiments with glass bottles such as making music by filling glass bottles to different heights and changing their sound. Students perform experiments with cans such as putting several different types of pop into a tub of water to see if any float or sink. Students share what they have learned by creating a poster or slideshow showing facts about manufacturing, recycling, and experiments with pop bottles and pop cans.  **A1.3, A1.4, A.2** **Design & Build Bee Houses** Students research, design, build, and test (in real life, or virtually) houses for solitary bees and use micro:bit technology to monitor the temperature. Students can also create media to	**C2.4** describe properties of sound, including that sound travels through a medium as a wave and that sound can be absorbed or reflected and modified **C2.5** explain how vibrations cause sound waves **C2.6** describe how different objects and materials interact with light and sound energy **D1.1** assess the impacts of machines and their mechanisms on the daily lives of people in various communities **D1.2** assess and compare the environmental impacts of using different machines designed for similar purposes **D2.5** explain how forces are changed in a variety of machines **E1.2** assess social and environmental impacts of extracting and refining	collect data to analyse.	

		describe the construction process using an algorithm.	rocks and minerals and of manufacturing, recycling, and disposing of products derived from rocks and minerals, while taking various perspectives into account **E2.4** describe everyday uses of rocks and minerals		