Long Range Model 2 - Grade 5

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						

Overview

Educators will be able to introduce and integrate Human Health and Body Systems throughout the year; this LRP contains several cross-strand STEM activities which allows students to continuously deepen their knowledge and understanding of the big ideas in Grade 5. Term 1 also focuses on Properties of and Changes in Matter, with many opportunities for cross-strand and cross-curricular opportunities for students to deepen their understanding of the big ideas. STEM activities are an essential part of this LRP, and many options are provided for teachers to choose from that best suit their particular class, school, and community.
Nature, seasons, special events, and natural environments help educators to connect and deepen the learning for students, especially when educators allow for cross-curricular integrations.

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 giving them the opportunity 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 in order 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?

Strands & Expectations (in addition to the Strand A expectations listed at the beginning of this document):
B. Life Systems: Human Health and Body Systems
B1 Relating Science and Technology to Our Changing World:
B1.1 assess effects of a variety of social and environmental factors on human health, and describe ways in which individuals can reduce the harmful effects of these factors and take advantage of those that are beneficial
B1.2 evaluate beneficial and harmful effects of various technologies on human health and body systems, while taking different perspectives into consideration
B1.3 explain how food literacy can support decisions that affect physical and mental health

B2 Exploring and Understanding Concepts:
B2.1 identify systems of the human body, and describe their basic function
B2.2 describe the basic structure and function of vital organs in various systems in the human body
B2.3 describe interrelationships between human body systems
B2.4 identify various diseases and medical disorders in humans and the organs and/or body system or systems that they affect

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
September **October** **November**	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and Community.  **A1.3, A.2** **Body Systems Flip Book:** Students research the major body systems (respiratory, digestive, excretory, skeletal, muscular, nervous) and use acetate or paper to design a flip book that shows all of the systems and labelled major organs using the same-sized body; students could also complete the same activity by coding a series of slides with Scratch or another block-based code (B2.1 - B2.3)  **A1.3, A1.5** **Build a Body Cooperative Activity**: Teachers create groups of students to work on different major body systems and use large sheets of paper to draw labelled organs; student groups present their body systems to the class and post their work in the class.	What factors do you think affect human health the most? What role do food and drink choices play in your overall health? What role does exercise play in your overall health? How do the systems of your body work together to keep your body running? What environmental factors affect our health and what can we do about mitigating their effects? How does the equilibrium between the internal and external forces allow the human body to function? What is traditional wellness and healing and how can we use it to live more sustainably?	**Connection to Environment, Stewardship, & Indigenous Understandings** Traditional Indigenous wellness and healing knowledge include practices that are not commonly used or known in non-Indigenous communities. It is important to present these ways of knowing alongside practices that are derived from other cultures. Inviting Indigenous speakers to the classroom to teach students about traditional wellness and healing is recommended. More information can be found in the Resources column. **Mathematics:** Measuring, collecting data, counting, and analysing data use many mathematical skills found in the STEM activities in this unit. A Bevy of Beverages: Analyse nutrition labels from some common beverages. In a chart, record each drink's ingredients, serving size, calories, total sugar, and total	Health Resources for Canadian Educators: Outdoor Education Links to be used throughout the year: Resources to support outdoor learning and opportunities for teacher training. *Project Wild* by Canadian Wildlife Federation Learning for a Sustainable Future. 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: Let's Talk Science: STEM at School | Let's Talk Science STEM kits, and other supplies can be found at • Kidder Canada • Flinn Scientific Canada	**First Steps:** Be sure to review safety guidelines for all experiments and activities and instruct students to follow safety guidelines. Please check the safety notes at the end of the LRP for more ideas. STAO Safety in Elementary Science and Technology Before beginning this unit, teachers may want to collect items such as balloons, plastic bottles, straws, marbles, acetate, paper plates, petroleum jelly, and string for the experiments and STEM activities mentioned. For STEM activities that require construction, other materials such as recyclables for makerspace-type activities are important to consider. For construction, consideration may be given to collecting and/or

	 **A1.1, A1.2, A1.3, A1.4, A1.5, A.2** **Digestive System Inquiry:** Students research the parts of the digestive system; students design, build and test a model of the digestive system that will allow a marble (bolus) or a liquid to travel through the system; students communicate their findings by describing the process going through the various organs; students could also code this process using Scratch or other block-based coding platforms (B2.1 - B2.3)  **A1.1, A1.2, A1.3, A1.4, A1.5, A.3** **Air Pollution Inquiry** Students research leading causes of air pollution in Canada, worldwide, and/or in their community; students build, design and test a pollution catcher (one version can be built using a paper plate and petroleum jelly and study the air in and around their school and/or community); students choose an issue to focus on, such as asthma, causes of airborne toxins, or other effects of air pollution on the human body and the environment, and create a media work that describes their findings and outline ways to stop air pollution.		caffeine per serving. **Evaluate and discuss:** Which drink(s) would you limit or avoid? Why? Which drink do you think is the best choice? **Language:** **System Showdown! "**Your body systems (e.g., respiratory system, digestive system, etc.) are competing to be declared 'System of the Year.' Choose the system that you think is the most important to human health. Write a speech from the systems' point of view, outlining the reasons you think you deserve the title of 'System of the Year.'" *Remember to include specific details about how you (the body system) benefit human health. **Social Studies** Cross-Curricular Connection Strand B and C also includes Social Studies expectations from B - People and Environments Visual Arts: Create a poster that illustrates ways that people can improve their physical and mental health.		purchasing glue guns, wood glue, balsa wood, and small saws - see Kidder link in Resources for ideas. Aboriginal traditional healing | Canadian Cancer Society **Next Steps** Nutrition Month in Canada is observed in March. This offers an opportunity to spiral and reinforce the information that students learned in the Life Systems unit earlier in the school year. The Ontario Science Center offers virtual "Body Works" field trips which are designed to meet the curriculum expectations in the Grade 5 Life Systems unit. Invite students and their families to submit ideas for healthy snacks and meals that they eat at home. Students can write (or find) the recipe(s) for their favourite healthy food(s). These can be compiled into a class cookbook, featuring

	 **A1.2, A1.3, A1.4** **Bones and Muscles Investigation:** students build, design, and test models of arms that use pulleys as muscles and cardboard as arm bones so that the lower arm bones (radius and ulna) are pulled up by the muscle (triceps) connected to the upper arm bone (humerus); students test their arm pulleys to see if they can lift a weight; students record their observations  **A1.3, A1.4** **Alien Design** Students design and build a working (moving) skeleton based on an alien that they have created. Students explain the functionality of the skeletal structures that allow the alien to move efficiently.  **A1.1, A1.5, A.3** **Culminating Task** What are some technologies that are harmful to human health that are used in your community? Design an awareness campaign that proposes ways in which individuals can reduce the harmful effects of these technologies. Keep your audience (community members) in mind when creating your campaign.		**Physical and Health Education:** Use pedometers to track steps at school every day for 1 week.* **Evaluate and Discuss:** Are step-tracking devices beneficial for human health? Can you design a device that would be beneficial for human health? *If pedometers are not available, students can track their "active minutes," over the course of a week, and discuss whether they meet the recommended amount of 60 minutes per day. They can then brainstorm ways to help themselves and others reach this goal. (Students can also code pedometers using micro:bits or other microsize computers if available.)		recipes for healthy living along with a preface that includes students' tips & ideas for leading an active and healthy life. If you are interested in getting your school involved in environmental initiatives, consider signing up for Ecoschools Canada - there are many great resources and activity ideas that connect to the Grade 5 Ontario Science Curriculum. Invite a guest speaker such as a local community member in the health field to speak to students about their career path and ways to be healthy.

Strands & Expectation (in addition to the Strand A expectations listed at the beginning of this document):

C. Matter and Energy: Properties of and Changes in Matter

C1 Relating Science and Technology to our Changing World
C1.1 assess the impacts on society and the environment of various processes used in the manufacture of common products
C1.2 assess how the use of specific materials in the manufacture of common products affects the environment, and identify actions that society and individuals can take to mitigate negative impacts

C2 Exploring and Understanding Concepts
C2.1 describe matter as everything that has mass and occupies volume
C2.2 identify the states of matter, and describe characteristics and properties of solids, liquids, and gases
C2.3 describe changes of state of matter observed at home, in the community, or in the natural environment
C2.4 describe physical changes in matter as changes of the state, volume, or form of the matter that do not result in the formation of a different substance
C2.5 describe chemical changes in matter as changes that result in the formation of different substances, and identify signs that a chemical change has occurred
C2.6 explain how changes of state can occur when matter absorbs or releases thermal energy
C2.7 explain why specific physical properties of various solids, liquids, and gases make them useful for particular applications

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
November December January	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community. **A1.1, A1.3** **States of Matter Hunt:** Students look around the school, classroom, schoolyard, and/or community for examples of solids, liquids, and gases. Students make a tally of what they observe and discuss the properties of each.	How are some common products manufactured (e.g., paper, clothing, potato chips, etc.)? What materials are used during the manufacturing process of specific products? How does the manufacturing of specific products impact society and the environment? What are some actions that people (individually or as a	**Connection to Environment, Stewardship, & Indigenous Understandings** The Grade 5 Social Studies strand *People and Environments: The Role of Government and Responsible Citizenship* offers many opportunities for connecting the *Properties of and Changes in Matter* science strand to the environment, stewardship, and Indigenous understandings strand. For example, students can use	Outdoor Education Links to be used throughout the year: Resources to support outdoor learning and opportunities for teacher training. *Project Wild* by Canadian Wildlife Federation Learning for a Sustainable Future. Action Project funding opportunities with resources for outdoor learning and UN Sustainability goals Learning for a Sustainable	**First Steps:** Be sure to review safety guidelines for all experiments and activities and instruct students to follow safety guidelines. Please check the safety notes at the end of the LRP for more ideas. Before beginning this unit, teachers may want to collect items such as plastic bags, Borax, white glue, corn starch, food colouring,

	 **A1.1, A1.2, A1.4** **Winter States of Matter Exploration** Students observe the three states of water, outside if possible, and compare solid water (ice) volume to liquid water volume by collecting a beaker of ice, measuring its mass and volume, and then waiting until it melts and repeating the process. Students record their observations and draw conclusions. Students research how frozen is different than liquid water and discuss their findings.  **A1.1, A1.3, A1.4, A1.5** **States of Matter Models:** Students use plasticine and toothpicks to build models of solids, liquids, and gases or use a coding program like Scratch or another text-based coding to create digital models that compare the three states.  **A1.2, A1.4** **Slime versus Magic Mud** (chemical versus physical change); students prepare magic mud and slime using teacher-approved recipes and investigate how both substances have properties of both solid and liquid and are prepared	society) can take to mitigate the negative impacts of the manufacturing of specific products? What is matter? What are the states of matter? How are they characterized? How would you describe and define the “physical changes in matter”? Have you observed changes of state in matter in the world outside of the classroom? Explain. How would you describe and define “chemical changes in matter”? Can changes of state occur when matter absorbs or releases thermal energy? Explain. How do the physical properties of solids, liquids, and gases make them suitable for specific applications?	the following Sample Questions from Social Studies expectation B2.1 when assessing “how the use of specific materials in the manufacture of common products affects the environment” (Overall Science expectation C1.2): “What costs and benefits should be considered when discussing the development of a new mine or energy project? Whose knowledge and understanding of the land need to be included throughout the consultation process? Why might different groups have different opinions on such development?” **Mathematics:** Measuring, collecting data and tallies, and analysing data use many mathematical skills found in the STEM activities in this unit. Measure the mass and volume of a benchmark item. Predict the mass and volume of other objects based on the benchmark item. Different materials have different densities. Of the objects you measured, which	Future. STEM Learning Challenges year-long activities and resources found on *STEM at School* by Let’s Talk Science STEM kits and other supplies can be found at • Kidder Canada • Flinn Scientific Canada	plasticine, toothpicks, and items needed for milk plastic for the experiments and STEM activities mentioned. **Next Steps:** Students can organize a school-wide “Waste-Free Lunch Day” to solidify their understanding of concepts and incorporate skills from other content areas (e.g., Language Arts, Mathematics). It is recommended that this event be held later in the year, to coincide with Science Strand E *Earth and Space Systems: Conservation of Energy and Resources.* This will allow students to connect and deepen their understanding of both manufacturing and conservation. More Information can be found at: EcoSchools Canada

	with both solids and liquids; students let the substances dry out to observe changes to their substances; students connect what they have seen to physical and chemical changes (physical - evaporation of water, chemical - a creation of a new substance that cannot be reversed).  **A1.2, A1.4** **Ice to Water to Steam Investigation:** Students observe all three states of water by observing ice melting into water and tracking the process by measuring time and temperature throughout; students then observe the teacher boiling water on a hot plate and track the temperature and time of that demonstration; students create a change of state graphs with the data collected and describe what happens to water when it changes state by adding heat.  **A.3** **Culminating Task:** *Social Studies Expectation B1.3* Create a plan of action to address an environmental issue of local, provincial/territorial, and/or national significance (e.g., regulating industrial practices that damage the environment), specifying the actions		was the least dense? The most? How do you know?" **Language Arts:** Choose 2 products that serve a similar purpose but are manufactured differently and may be composed of different materials (e.g., plastic and paper straws). Which product has the least harmful impact on society and the environment? How would you persuade people in your community to use this product? (e.g., create a blog post, a YouTube ad, a letter to the town council, a radio ad, etc.). Your writing should include details that help convince the audience to use the product that is the least harmful. Students can research skilled trades related to chemical engineering and manufacturing. They can make a list of the skilled trades they find and choose one to research the career path. **Social Studies:** "In Ontario, mining is a major industry. What do you think would happen if a significant silver deposit was discovered		

	to be taken by the appropriate government or governments, including Indigenous governments, as well as by citizens.		under your school's playground?" **Social Studies expectation B2.1:** Whose knowledge and understanding of the land need to be included throughout the consultation process? Why might different groups have different opinions on such development? Why might there be a variety of Indigenous viewpoints on resource extraction on the traditional territory? Why does the federal and/or provincial government tend to support resource extraction industries?		

Term 2 - Overview, Guidelines, Best Practices, and Assessment Ideas

Educators will be able to introduce and integrate Structures and Mechanisms throughout this term and connect to prior learning; this LRP contains several cross-strand STEM activities which allow students to continuously deepen their knowledge and understanding of the big ideas in Grade 5. Term 2 also focuses on the Conservation of Energy and Resources, with many opportunities for cross-strand and cross-curricular opportunities for students to deepen their understanding of the big ideas. STEM activities are an essential part of this LRP, and many options are provided for teachers to choose from that best suit their particular class, school, and community.

Nature, seasons, special events, and natural environments around us, help educators to connect and deepen the understanding for students, especially when educators allow for cross-curricular integrations.

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 giving them the opportunity 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 in order 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?

Strands & Expectations (in addition to the Strand A expectations listed at the beginning of this document):
D. Structures and Mechanisms: Forces Acting On Structures

D1 Relating Science and Technology to our Changing World
D1.1 analyse the effects of forces from natural phenomena on structures in natural and built environments
D1.2 assess various ways in which humans mitigate impacts of forces from natural phenomena on structures in urban, rural, and remote communities

D2 Exploring and Understanding Concepts
D2.1 identify internal forces acting on a structure, and describe their effects on the structure
D2.2 identify external forces acting on a structure, and describe their effects on the structure
D2.3 describe forces resulting from natural phenomena that can have severe consequences for human-built structures, and identify structural features and materials that can allow such structures to withstand these forces
D2.4 describe ways in which physical characteristics of various animal and plant species help to protect them from potentially harmful effects of forces
D2.5 describe ways in which protective equipment helps to protect humans from potentially harmful effects of forces

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
February March April	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.  **A1.1, A2** **Internal forces acting on a structure Investigation:** Students identify and describe the 4 internal forces (tension, compression, torsion, and shear, and provide examples of each force by drawing them out or using a coding platforms such as Scratch or	What are some natural forces that act on structures? How can natural forces affect structures (both organic and man-made)? How can people (individually or as a society) mitigate the impacts of natural forces on structures in various communities? What are the internal forces	**Connection to Environment, Stewardship, & Indigenous Understandings** In the far north of Canada, people must use modified methods for building houses. This is because the ground is permafrost (permanently frozen), and if typical building methods were utilized, the heat loss from the home would melt the permafrost and destabilize the foundation. Students can research the	FloodSmart Canada: Educational Resources on Flooding in Canada and Discussion questions STEM Learning Challenges year-long activities and resources found on *STEM at School* by Let's Talk Science STEM kits and other supplies can be found at • Kidder Canada • Flinn Scientific Canada	**First Steps:** Be sure to review safety guidelines for all experiments and activities and instruct students to follow safety guidelines. Please check the safety notes at the end of the LRP for more ideas. Before beginning this unit, teachers may want to collect items such as newspaper,

	other block-based code to act out the 4 forces  **A1.2, A1.3, A1.4, A1.5** **Dynamic and Static Loads Experiment:** Students design, build and test towers out of rolled-up newspaper (2 pages) and tape (arm's length). Teachers apply 2 tests: a static load of 3 textbooks and a dynamic load of blowing a fan at high speed in the middle of the tower. Students observe and draw conclusions about their tower design.  **A1.1, A1.2, A1.3, A1.4, A1.5** **Earthquake-proof home versus flood-proof home:** Students research methods used currently or in the past to help buildings be earthquake-proof or flood-proof; students design, build and test homes that they build using recyclable materials, newspaper, and/or balsa wood to see how earthquake-proof and/or flood proof they are; students modify their buildings based on results to create a building with the best results they can; students communicate their learning by displaying their homes and describing the process of building and highlighting key	acting on structures? What are the external forces acting on a structure? How do internal and external forces affect a structure? What are some features that allow structures to withstand forces from natural phenomena? What are some physical characteristics of plant and animal species that help to protect them from potentially harmful effects of forces? What are some ways that humans use protective equipment to help protect them from potentially harmful forces?	methods that people have devised for building homes in areas where there is permafrost. They can then research the methods the Inuit people used to build stable homes on permafrost for thousands of years. **Mathematics:** Measuring, collecting data and tallies, and analysing data use many mathematical skills found in the STEM activities in this unit. Infographics: Have students analyse the flooding infographic from FloodSmart Canada: **Language Arts:** Career Spotlight: Choose to research two of the following professions: meteorologist, seismologist, architect, disaster manager, and environmental scientist. Based on your research, write a descriptive paragraph about which career you think is better and why. You can consider how much education is needed, average salary, need to travel, job-related risks and rewards, job availability, etc.		tape, clay, cotton balls, red food colouring, stir sticks, straws, etc. for the experiments and STEM activities mentioned. For STEM activities that require construction, 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. **Emergency Preparedness Week** occurs during the first full week of May every year. More information can be found at: About Emergency Preparedness Week The Ontario Science Centre is home to the world's largest hydraulophone. A visit to the Science Centre (either in-person or virtual) can introduce students to this instrument that uses the force of water to make sounds.

	building elements they chose and why they chose them.  **A1.2, A1.4** **Landfill Site Investigation:** Students investigate how landfills are designed to deal with leachate; students build model landfills using clay and other materials approved by the teacher (cotton balls soaked in red dye can serve as the landfill); students flood their landfills by pouring water them and simulate an earthquake to see if their model holds; students communicate their findings by displaying their models and creating media works for the displays.		Students explore the ideas behind 'Green Buildings' and research buildings that have been built using these technologies, such as the Toronto Dominion Centre and the Climate Pledge Arena in Seattle. Students present their findings by creating media works such as posters or multimedia presentations. **Health and Physical Education:** What are some pieces of protective equipment that you can use to maximize safety and lessen the risk of injury, including the risk of concussion, during physical activities (such as biking, playing hockey, rock climbing, etc.)? How do these devices help protect people from the potentially harmful effect of forces? **Plant and Animal Structures Investigation:** Students examine the human skeleton and research how the human skeleton protects vital organs such as the brain and the heart. Students research		Earth Month activities and initiatives such as yard cleanups, waste reduction challenges, and Earth Day activities can be found at Earth Day Canada Invite a guest speaker such as a community member that is involved in construction and skilled trades related to construction to share his/her expertise. -

			and present 5 interesting facts about the strength and structural stability of the human skeleton.		

Strands & Expectations (in addition to the Strand A expectations listed at the beginning of this document):
E. Earth and Space Systems: Conservation of Energy and Resources:

E1 Relating Science and Technology to our Changing World
E1.1 analyse long-term impacts of human uses of energy and natural resources, on society and the environment, including climate change, and suggest ways to mitigate these impacts
E1.2 evaluate effects of various technologies on energy consumption, and describe ways in which individuals can use technology to reduce energy consumption
E1.3 analyse how First Nations, Métis, and Inuit communities use their knowledges and ways of knowing to conserve energy and resources

E2 Exploring and Understanding Concepts
E2.1 identify a variety of forms of energy, and describe how each form is used in everyday life
E2.2 demonstrate an understanding of the law of conservation of energy, including how energy cannot be created or destroyed but can only be transformed from one form to another
E2.3 describe how energy is stored as potential energy and transformed in a given device or system
E2.4 demonstrate an understanding that when energy is transformed from one form to another, some energy may dissipate into the environment in the form of heat, light, and/or sound energy
E2.5 identify renewable and non-renewable sources of energy
E2.6 explain how the use of energy derived from fossil fuels changes the composition of the atmosphere and how these changes contribute to climate change

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
April May June	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community. **A1.1, A1.5** **Energy Hunt:** Students look for forms of energy, such as light, sound, mechanical,	How do humans use energy and natural resources? What are the long-term impacts of human use of energy and natural resources? (Consider impacts on society and the environment, including climate change.)	**Connection to Environment, Stewardship, & Indigenous Understandings** The Resilience Project has curated 50 works of art created by female Indigenous artists. The images can spark discussions about interconnectedness,	Science North Hands-On Lessons. Lesson plans about sustainability and energy can be found in The World's Largest Lesson, Resources section. STEM Learning Challenges year-long activities and	**First Steps:** Be sure to review safety guidelines for all experiments and activities and instruct students to follow safety guidelines. Please check the safety notes at the end of the LRP for more ideas.

	potential, kinetic, etc., in the classroom, school, and schoolyard; teachers provide various items that use different forms of energy such as balls, children's toys, and electronic devices; students identify and tally the items they find for the different forms of energy.  **A1.2, A1.3, A1.4, A1.5** **Rube Goldberg Investigation:** Students design, build, and test a Rube Goldberg contraption that has at least 3-5 energy transformations in it; students draw, describe, and analyse the effectiveness of their designs.  **A1.1, A1.5, A.2** **Renewable versus Non-Renewable Energy Research Project:** Students work independently or in pairs to investigate a non-renewable energy resource and compare it to a renewable energy resource; students display their research by creating a media work such as a poster or multimedia presentation or by using a coding platform such as Scratch or other block-based code to make a game or slideshow using their research.	How can humans mitigate the negative impacts of their use of energy and natural resources? What are the effects of various technologies on energy consumption? How can people use technology to reduce energy consumption? How do First Nations, Metis, and Inuit communities use their knowledge and ways of knowing to conserve energy and resources? What are some forms of energy? How are they used in everyday life? What is the law of the conservation of energy? How would you describe how energy is stored as potential energy and transformed in various devices/systems? Can you identify some renewable and non-renewable sources of energy? How would you explain how the use of energy derived	stewardship, Mother Earth, and climate change. (Images 10 and 48 are especially powerful for sparking thinking and discussion about these topics.) See the Resilience Project website for all 50 images and a free teaching guide. **Mathematics:** Measuring, collecting data and tallies, and analysing data use many mathematical skills found in the STEM activities in this unit. **Language Arts:** Earth Day is celebrated on April 22nd every year. Write 5 slogans or jingles for Earth Day that encourage people to conserve energy in a specific way (e.g., recycle, carpool, turn off lights, use less water, etc.). Students write persuasive pieces about topics related to sustainability that they consider important to them, such as energy conservation, pollution issues, microplastics issues, climate change, and others. Students could also write letters to their local government representatives	resources found on *STEM at School* by Let's Talk Science. STEM kits and other supplies can be found at ● Kidder Canada ● Flinn Scientific Canada Build an Elastic Racer. Full lesson plan from the Ontario Science Centre	Before beginning this unit, teachers may want to collect items for the experiments and STEM activities mentioned such as cardboard, plastic sheets, spools, balloons, items for mousetrap cars and/or solar cookers, Rube Goldberg items such as elastics, tape, etc. For STEM activities that require construction, 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. **Next Steps:** Students can organize a school-wide "Waste-Free Lunch Day" to solidify their understanding of concepts and incorporate skills from other content areas (e.g., Language Arts, Mathematics). Additionally, students will revisit and

	 **A1.1, A1.2, A1.3, A1.4, A1.5** **Turbine Investigation:** Students investigate how renewable and non-renewable power generation both use turbines to create energy; students design, build and test a model of a wind or water turbine that will transform wind/water movement into other forms of energy, such as mechanical energy, to lift or pull an object a specified distance; students modify their original design to test if different turbine fin shapes or the number of turbine fins improve or change the results of their experiment; students communicate their learning by describing the energy transformations during the demonstration and describe the changes they made to improve their design. *(Cross Curricular Connection Strand E and Strand D: Structures and Mechanisms)*  **A1.2, A1.3** **Mousetrap Cars/Balloon Cars:** Students design, build, and test various models of elastic or air-powered cars to see whose car can go the furthest distance; students communicate their learning by displaying their cars and describing	from fossil fuels changes the composition of the atmosphere? How do these changes contribute to climate change?	about these issues. Students research various energy conservation career paths and make a list to share with the class. Students then choose one career to research the career path and describe why he/she would choose that job. **Social Studies:** Choose an issue related to energy or resource use that is important to you (e.g., reducing the amount of garbage that goes to the landfill; reducing carbon emissions from cars; increasing the percentage of people who recycle, etc.) What are the most difficult challenges associated with this issue? Come up with a way to help address this issue, taking the viewpoints of all stakeholders into consideration. **Drama**: Working with a small group (2-4 students), create a series of 3 tableaux that demonstrates how energy can be stored as potential energy and transformed into a given device or system.		strengthen the knowledge they gained from Science Strand C *Matter and Energy: Properties of and Changes in Matter.* More Information can be found at: EcoSchools Canada Clean Cooking | The World's Largest Lesson Full lesson and downloadable resources are available from Science North in the lessons Energy Storage Device Parts 3-5. World Environment Day is celebrated on June 5th every year. It is a global day, organized by the United Nations, to encourage the protection of our environment.

	the energy transformations in their cars.  **A1.1, A1.2, A1.3, A1.4** **Solar Cookers and Homes:** Students design, build and test a solar cooker and attempt to heat water with it; students investigate how solar heating can be passive or active; students use their previous learning to design, build, and test a model home that uses the same principles as their solar cooker to provide hot water, heat, and electricity to their homes (they can also use solar panels if available); students communicate their learning by displaying their cookers and homes and create media works about them. See the Resources column for a sample lesson plan.  **A1.1, A1.2, A1.3, A1.4, A1.5** **Culminating Task:** Students will create an energy storage device that is safe for the environment. This will take 3 or more class periods. See the Resources column for a sample lesson plan.		**Health and Physical Education:** Shell acidification: conduct an experiment to demonstrate how climate change can affect the shells of mollusks. (Full lesson plan is available from the Canada Science and Technology Museum. Discuss the different ways that climate change may be affecting the health of other organisms (including humans).		