Long Range Model 1 - 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

Term 1 - Overview, Guidelines, Assessment Ideas:
In term one, students will explore in depth the concepts included in human health and how the environment affects the human body. They will develop their knowledge in all science strands by investigating the Big Question: "How is human health impacted by current methods of construction, energy production, and resource use/extraction/production and our current way of life?" Term 1 combines the Human Body and Energy with Biodiversity and Electricity with a focus on environmental issues from energy resources**.**

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 the following:

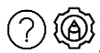
- Honoring students' background knowledge and inviting them to share what they know
- Becoming a co-learner with students when uncovering content guided by students' wonderings
- Encouraging students to ask good questions and allowing them to find answers and/or solutions
- Supporting students as they 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 practice 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 Timeline	Big Ideas and Guiding Questions for an Inquiry Stance	STEM Skills and Connections (Strand A)	Strands and Expectations	Cross-Curricular Integrations	Resources
September October	**Human health and how it is affected by our choices and the environment**	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and Community.	**B1.1** assess effects of a variety of social and environmental factors on human health, and describe ways in which	**Mathematics** Measuring, collecting data, counting, and analysing data use many mathematical skills found in	**First Steps:** Be sure to review the safety guidelines for all

	Big Ideas: Discuss how organ systems are components of a larger system and, as such, work together and affect one another, linking them to their functions. Discuss how human health is affected by environmental factors such as air pollution. **Guiding questions:** 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	 **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 labeled 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  **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 labeled organs; student groups present their body systems to the class and post their work in the class.  **A1.1, A1.2, A1.3, A1.4, A1.5, A.2** **Digestive System Inquiry:** students research the parts of the digestive system; students	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 **B2.1** 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 **C1.1** assess the impacts on society and the environment of	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 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 Arts** **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. **Health & Physical 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	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. Aboriginal traditional healing | Canadian Cancer Society First Nations Approaches to Traditional Medicine. **Connecting Science with 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

	human body to function? What are traditional wellness and healing practices and how can we use them to live more sustainably?	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.  **A1.1, A1.3** **Model Lung Activity** Students research how lungs work as part of the respiratory system and what keeps lungs healthy; students build a model lung using a plastic bottle, balloon and straw; students communicate their findings by producing media works about lung health.  **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	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	human health? *If pedometers are not available, students can track their "active minutes," for a week, and discuss if they meet the recommended amount of 60 minutes per day. They can then brainstorm ways to help themselves and others reach this goal. **Social Studies:** Research and compare the traditional diets of selected Indigenous and European communities in what would eventually become Canada. **Evaluate and discuss:** Do you think your current diet more closely resembles a traditional Indigenous or European diet? What factors influence a person's diet? (*e.g., climate; availability/ affordability of food; customs and traditions, etc.*) **The Arts** Create a poster that illustrates ways that people can improve their physical and mental health.	Learning for a Sustainable Future. Action Project funding opportunities with resources for outdoor learning and UN Sustainability goals Learning for a Sustainable Future **Next Steps:** **Field Trips** The Ontario Science Centre offers virtual "Body Works" field trips which are designed to meet the curriculum expectations in the Grade 5 Life Systems unit. Body Works - Virtual School Programs 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 **Food Literacy** Invite students and their families to submit ideas for healthy snacks and meals

		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 outlines ways to stop air pollution.  **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.		**Connection to Environment, Stewardship, & Indigenous Understandings** Traditional Indigenous wellness and healing includes 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.	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 recipes for healthy living along with a preface that includes students' tips & ideas for leading an active and healthy life. 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. If you are interested in getting your school involved in environmental initiatives, consider signing up for Ecoschools Canada. There are many resources and activity ideas that can get you certification with the grade 5 science curriculum.
October November	**How construction practices, extreme weather, and climate change affect humans and their health** **Big Ideas**:	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.	**B1.1** assess the 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	**Language Arts** **Career Spotlight**: Choose to research two of the following professions: meteorologist, seismologist, architect, disaster manager, and environmental	**First Steps:** **STEM Learning:** Before beginning this unit, teachers may want to collect items such as newspapers, tape, stir sticks, straws, etc.

	Analyse the effects of certain factors on human health **Guiding questions:** How does the equilibrium between the internal and external forces allow the human body to function? What would happen if internal forces were larger than external forces? What forces influence the human body's functionality? 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?	 **A1.1, A1.5** **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 platform such as Scratch or 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.  **A1.2, 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	are beneficial **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 **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 **D2.4** describe ways in which physical characteristics of various animal and plant species help to protect them from potentially harmful effects of forces	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.). **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? **Mathematics:** Measuring, collecting data and tallies, and analysing data use many mathematical skills found in the STEM activities in this unit.	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. **Next 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

		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			
November December	**How energy production and use of energy resources affect humans and their health** **Big Ideas**: Assess effects of energy and resource use on human health, society, and the environment, and suggest options for conserving energy and resources **Guiding Questions:** What are some forms of energy? How are they used	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and Community.  **A1.1** **Energy Hunt:** Students look for forms of energy, such as light, sound, mechanical, 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	**B1.2** evaluate beneficial and harmful effects of various technologies on human health and body systems, while taking different perspectives into consideration **B2.1** identify systems of the human body, and describe their basic function **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	**Mathematics:** Measuring, collecting data and tallies, and analysing data use many mathematical skills found in the STEM activities in this unit. Build an Elastic Racer. See Resources column for the lesson plan. **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.	**First Steps:** **STEM Learning:** 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

	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 from fossil fuels changes the composition of the atmosphere? How do these changes contribute to climate change? 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.) How can humans mitigate	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 design.  **A1.2, A1.3, A1.4, A1.5** **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 the energy transformations in their cars  **A1.1, A1.3, 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	affect **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	**Language:** Students can research and read books about energy and energy production, as well as issues related to energy. Teachers can provide reading materials. 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.	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. Build an Elastic Racer. Full lesson plan from the Ontario Science Centre. **Visual resources:** OTF Conservation of Energy Lessons and Resources: **Next Steps:** STEM Learning Challenges year-long activities and resources *STEM at School* by Let's Talk Science If you are interested in getting your school involved in environmental initiatives, consider signing up for Ecoschools Canada - there are many resources and activity ideas that can get

	the negative impacts of their use of energy and natural resources? What are the effects of various technologies on energy consumption?	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.			you certification with the grade 5 science curriculum, and there are also energy resources and activities. 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.
December January	**How physical and chemical changes affect humans and their health** **Big Ideas**: Assess the impacts on society and the environment of various processes and materials used in the manufacture of common products and ways to mitigate negative impacts **Guiding Questions:** What are the various states of matter? Does each state of matter emit the same amount of energy?	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and Community.  **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 ice is different than water and discuss their findings.	**C1.1** assess the impacts on society and the environment of various processes used in the manufacture of common products **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	**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 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	**First Steps:** **STEM Learning:** Before beginning this unit, teachers may want to collect items such as plastic bags, Borax, white glue, corn starch, food colouring, plasticine, toothpicks, and items needed for the experiments. 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

	How does that influence energy production?	 **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, A1.3, A1.4** **Clouds in the Classroom:** Students create a model of the three states of matter with this water experiment. See the Resources column for activity.  **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 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	**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. **E1.2** evaluate the effects of various technologies on energy consumption, and describe ways in which individuals can use technology to reduce energy consumption **E2.3** describe how energy is stored as potential energy and transformed in a given device or system	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 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. **The Arts:** Make milk plastic sculptures. The process of making milk plastic involves chemically altering liquid milk so that it becomes a solid. Instructions and information about the science behind milk plastic can be found online. **Health and Physical Education:** Solids, Liquids, Gases game. In a large, open area (e.g., gymnasium), students will pretend to be molecules in different states of matter. To start, play some music, and explain the game:	Scouts Canada Water Cycle in a Bag activity. **Next Steps:** **Outdoor Education** 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  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:*

		and chemical changes (physical - evaporation of water, chemical - the 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 melt 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.  **A1.1, A1.2, A1.3, A1.4, A1.5, A.3** **Plastic Investigation:** Students investigate how plastics are formed; students make milk plastic and observe properties; students identify issues surrounding plastic (single use, recycling,		If you call “Solids!” students will get close together and vibrate in place. Calling “Liquids!” will prompt students to stay within 1-2 meters of each other and move slowly together around the space. Calling “Gases” should prompt students to move quickly and randomly about the space.	*Conservation of Energy and Resources.* This will allow students to connect and deepen their understanding of both manufacturing and conservation. This project includes waste audits and an awareness campaign. More information can be found at Influencing the next generation of environmental stewards - Circular Innovation Council and The Environmental Impact of Food Packaging - FoodPrint Information on how to sign up with Ecoschools Canada can also be found here and there are a lot of great resources there for waste audits, etc.

		microplastics, etc.) and create a media work about their findings; students organize a campaign about plastic issues in their school and/or community.			

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

In term 2, students will come to understand the impact that new technologies and traditional ways of knowing affect human health and the environment. Students will gain knowledge of current and emerging technologies of the world with regard to improving human and environmental health.

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 allows 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?

Month or Suggested Timeline	Big Ideas and Guiding Questions for an Inquiry Stance	STEM Skills and Connections (Strand A)	Strands and Expectations	Cross-Curricular Integrations	Resources
January February	**How we can use technology to build safer,**	**NOTE:** Teachers should choose from this list of STEM activities	**C2.2** identify the states of matter and describe characteristics and	**Connection to Environment,**	**First Steps:**

	better, and more environmentally sustainable buildings and structures **Big Ideas:** Analyse social and environmental impacts of forces acting on structures and assess ways to mitigate these impacts; demonstrate an understanding of forces that act on structures, and how various structures withstand them. **Guiding Questions:** Describe various types of energy production. How has energy production influenced urban, rural, and remote communities? What steps can be taken to lower the impact of forces on Structures? How can we make structures more sustainable? What materials do you think can make structures more	that best suits their students, school, and community.  **A1.1, A1.2, A1.3, A.1.4** **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 building elements they chose and why they chose them  **A1.2, A1.3** **Blowin' in the Wind:** Students use GOOS paper and tape to design, build and test a structure to withstand extreme wind (a fan).	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 does not result in the formation of a different substance **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 **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-	**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 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. **Social Studies** Create a thematic map that shows areas in Canada that have experienced strong (EF2 or higher) tornadoes in the past 3 years. Based on your map, which province has experienced the strongest tornadoes in the past 3	**STEM Learning** Before beginning this unit, teachers may want to collect items such as newspaper, tape, balsa wood, GOOS paper, and other building materials 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. **Next Steps:** FloodSmart Canada: Educational Resources on Flooding in Canada STEM Learning Challenges year-long activities and resources *STEM at School* by Let's Talk Science

	durable and more environmentally friendly?	 **A1.1, A1.2, A1.3, A1.4, A1.5** **Earthquake Resistant Structure Project:** Students can use various materials to build an earthquake-resistant structure. They should use their knowledge of internal and external forces to explain their design thinking. Lesson plans and designs for shake tables can be found online.	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	years? Make a graph of your findings and draw conclusions and predictions from it. **Language:** 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.	STEM kits and other supplies can be found at ● Kidder Canada ● Flinn Scientific Canada
February March	**How can we use technology to improve manufacturing practices and stop pollution?** **Big Ideas:** Internal and External forces acting on structures. Effects of technology on structures **Climate Change**: Propose/Analyse solutions to minimize the consequences of climate change on our earth and its people. **Guiding Questions:** What are the internal forces acting on structures?	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and Community.  **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 into them and simulate an earthquake to see if their model holds; students communicate	**B1.3** explain how food literacy can support decisions that affect physical and mental health **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	**Social Studies:** "In Ontario, mining is a major industry. What do you think would happen if a significant silver deposit was discovered 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	**First Steps:** Before beginning this unit, teachers will want to collect supplies such as cotton balls, clay, red food colouring, and items needed for the run-off activity. STEM kits and other supplies can be found at ● Kidder Canada ● Flinn Scientific Canada **Next Steps:**  Other lesson plans about sustainability and energy can be found in The

	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?	their findings by displaying their models and creating media works for the displays  **A1.1, A.3** **Run-off Water Investigation**: Students learn about watersheds and runoff, and investigate issues related to both in this activity - online links for this type of activity can be found to assist.  **A.3** **Action Project:** *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 to be taken by the appropriate government or governments, including Indigenous governments, as well as by citizens.	affect **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	resource extraction industries? **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. For example, students can use 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: "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 needs to be included throughout the consultation process? Why might different groups have different opinions on such development?"	World's Largest Lesson, Resources section.
April May	**How can we use technology to improve how we use and produce energy?**	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.	**C2.5** describe chemical changes in matter as changes that result in the formation of different substances, and identify signs	**Social Studies:** Choose an issue related to energy or resource use that is important to you (e.g., reducing the amount	**First Steps:** Before beginning this unit, teachers may want to collect

	Big Ideas: Evaluate and identify how renewable and non-renewable energies are produced and their effect on the environments of various communities. **Guiding Questions** What steps can we take to make sustainable and optimal use of energy? How can we make a difference in the global use of energy? Demonstrate how a simple machine produces energy. Describe a possible hazard of using a wrecking ball instead of explosives when demolishing a building. If more radiant energy was allowed to reach the surface of Earth, what do you think might happen? Why? Identify energy forms and sources in their community and the global community.	**A1.2, A1.3, A1.4** **Roll with it:** Students use recycled materials to design, build and test a device that rolls for 1-3 metres under its own power (transferring potential to kinetic energy). **A1.1, A1.2, A1.3** **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	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 **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	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, considering the viewpoints of all stakeholders. **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.).” **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, 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 in the Resource column.	items for the experiments and STEM activities mentioned such as cardboard, plastic sheets, spools, balloons, items for mousetrap cars, wheels, 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. These supplies can be found at • Kidder Canada • Flinn Scientific Canada Resilience Project website for all 50 images and a free teaching guide. World Environment Day STEM Learning Challenges year-long activities and resources *STEM at School* by Let’s

	Identify what energy choices could be made by people in the global community Discuss, construct, and consolidate ideas around different energy choices, including renewable and non-renewable energy sources.	 **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 the energy transformations in their cars.		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. Make a plan with your class to celebrate it by doing some projects in your school or community. **Mathematics:** Students use measurement and collect data during their experiments and STEM activities. Students analyse the data to draw conclusions.	Talk Science. **Next Steps:** 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
May June	**How can we use technology to improve human health and live more sustainably?** **Guiding Questions** Describe ways in which energy production buildings and structures are created and their impact on the Earth system. Discuss the economic benefits associated with mineral extraction and refining, including related careers, in Ontario.	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.  **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	**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 **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	**Health and Physical Education:** Shell acidification: conduct an experiment to demonstrate how climate change can affect the shells of mollusks. See the Resources column for activity. Discuss the different ways that climate change may be affecting the health of other organisms (including humans). **Mathematics:** Students use measurement and collect data during their experiments and STEM activities.	**First Steps:** Before beginning this unit, teachers may want to collect items for the experiments and STEM activities mentioned such as cardboard, aluminum foil, insulating items, balloons, wheels, and items for the storage device. For STEM activities that require construction, other materials such as recyclables for makerspace-type activities are important to consider.

	Pose questions or problems relating to the effects of human actions on global climate change and the sustainability of ecosystems that arise from personal research. Reflect upon your personal view of humanity's relationship with the environment. Discuss why it is important to consider economic, social justice, and environmental perspectives when examining sustainability. Select, integrate, and analyse the validity of information from various human, print, and electronic sources (e.g., government publications, community resources, and personally collected data), with respect to sustainability, sustainable development, and education for sustainable development.	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  **A1.2, A1.3** Students design, build and test a vehicle that uses alternative energy (wind, solar) to travel a specified distance in a given amount of time.  **A1.1, A1.2, A1.3, A1.4, A1.5** **Energy Storage Device Project:** 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 lessons and downloadable resources.	specific materials in the manufacture of common products affects the environment and identify actions that society and individuals can take to mitigate negative impacts. **E1.2** evaluates effects of various technologies on energy consumption and describes ways in which individuals can use technology to reduce energy consumption. **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	Students analyse the data to draw conclusions. **Language:** 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 about these issues.	For construction, consideration may be given to collecting and/or purchasing glue guns, wood glue, balsa wood, and small saws. These supplies can be found at ● Kidder Canada ● Flinn Scientific Canada. Science North in the lessons Energy Storage Device Parts 3-5. Shell Acidification by the Canada Science and Technology Museum.