Long Range Plan Model 2 - Grade 7

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:
September will introduce students to the scientific experimentation process and the engineering design process. Explain that neither process is linear, and their cyclical nature makes them wonderful places to explore self- and peer-assessment and the giving of feedback. Use this month to set safety standards and expectations. Introduce the United Nation's Sustainable Development Goals (SDGs) to your students and explain that they will frame your work throughout the year. Begin creating science journals that your students can use throughout the entire year to record their findings and conclusions, using this to build scientific communication and literacy skills. Throughout the year explore opportunities for your students to connect with their local communities through field trips, both virtual and in-person, and through discussion with classroom guests, both virtual and in-person. Think about when and where you might be able to connect with members of your community, and communities further abroad, to build connections and leverage expert voices to further student learning and understanding. Take regular opportunities to note where and when students are developing and using various STEM skills and note how those skills might be applicable to future education and career pathways. Encourage any classroom guests to speak about their use of STEM skills throughout their education and career histories as well.

Big Idea(s):
Scientists use the scientific experimentation and engineering design processes to explore the world around them
Scientific communication and literacy are important skills for all science learners
The engineering design process is grounded in empathy, and we can use the SDGs as a lens through which to explore problems and generate solutions

Strands & Expectations (in addition to the Strand A expectations listed at the beginning of this document):
Strand A: STEM Skills and Connections
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
A2.1 write and execute code in investigations and when modelling concepts, with a focus on planning and designing programs
A2.2 identify and describe impacts of coding and of emerging technologies, such as artificial intelligence systems, on everyday life, including skilled trades
A3.1 describe practical applications of science and technology concepts in various occupations, including skilled trades, 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

Strand D: Structures and Mechanisms
D1.1 evaluate environmental, social, and economic factors that should be considered when designing and building structures to meet specific needs for individuals and communities

September	**A1.2** Understand the scientific experimentation process by conducting various lab investigations. Throughout the year students	How do we, as scientists, use inquiry to understand the world around us? What is the scientific method? How do we use the scientific method to conduct reliable	**Language** Procedural writing in lab write-ups Generate, gather, and organize information to write for an intended purpose (results of research conducted)	STAO Safety in Elementary Science and Technology Ontario Science Centre's Teacher Resources Let's Talk Science's Careers	Consider weather during the first few months of the school year When will you be most able to conduct lessons or build projects outdoors?

	may be supported at all levels through various methods. Some students may require detailed lab outlines, including the use of images to support understanding. (https://chemix.org/ is a useful tool when creating lab handouts). At various times throughout the year, other students might be stretched through the opportunity to develop their own testable questions or lab procedures, designed to gather pre-determined data points. **A1.4** Follow health and safety protocols when conducting investigations **A1.5** Record observations in observation journals. When asking your students to keep science journals, meet them where they are in skill level. Some students may only be ready to record basic observations, while others may be ready to begin drawing detailed conclusions from their gathered findings. To support students at all levels, provide scaffolded	experiments? How do we use the engineering design process to empathetically design solutions to problems? How do we conduct experiments in a safe manner? How can we communicate the findings of our investigations clearly? How do the United Nation's Sustainable Development Goals (SDGs) inform our work as scientists and as learners? When exploring connections to the SDGs some students may only be working at a level where they are able to identify overlap between their work and relevant SDGs. Other students may be pushed to explore those connections more deeply while others still might be stretched to think about ways in which current practices could be adjusted to mitigate negative impacts or foster positive impacts.	**Math** Data collection & appropriate graph selection **Student Success** Career research & exposure to the skilled trades	Education Resources Science North's Educator Resources United Nations Sustainable Development Goals (SDGs)	Begin gathering materials for upcoming build projects throughout the year These could be recyclables or could be new materials purchased for this purpose. When reaching out to your community to ask for gathered materials, remember that some students' families may not be able to contribute Connect with local conservation authorities to arrange guest speakers or field trips for upcoming lessons Connect with other teachers within the division to make notes of any overlaps between your content and theirs, in order to leverage those connections to aid student understanding

	templates and exemplars for recording their observations and for creating conclusions.  **A1.5** Communicate findings for various audiences Provide various options for students to communicate their findings based on ability and comfort level. Some students may be supported through the option to record audio or video files, while others may be pushed to use a more formal written format. Various technological supports may be useful during these activities as well (e.g., Google read and write).  **A1.3** Follow the engineering design process to propose solutions to real-world problems, centering their work through empathy on user needs  **A1.3** Research, design, build, and evaluate assistive devices to address needs within the community, employing the engineering design process (e.g., devices to assist with				

	gripping a toothbrush, opening containers, carrying bags, walking on ice, etc.). To support students at all levels, provide a series of levelled benchmarks for projects of this nature. Some students may be working at a level where they are able to recreate a windmill using a provided template, while others may be working at a level where they are ready to explore multiple individual designs. Some students may be further pushed to evaluate and critique their designs, and those of their peers, incorporating revisions into their final designs. **A1.1** Research various careers and how they might leverage STEM skills and understandings. Prepare a research guide to support students in the research process - asking good questions, developing query terms, and citing sources. Provide 1-2 vetted research sources to support those students who need additional				

	direction.  **A2** Explore various unplugged and plugged coding activities to introduce concepts For example, how could students code a device to display their name? How could students code a device to represent different emotions?				

Overview: These months will be spent exploring the environment around us and beginning to understand the interactions that take place between the living and non-living components within a given ecosystem. When possible, take advantage of the weather and daylight hours to take your students outside. Begin your explorations into coding and computational thinking by coding a microcontroller to gather and record data about various environmental conditions, which can then be analysed by your students. Invite your students to investigate the connections between FNMI ways of knowing and traditional knowledge, and how they contribute to environmental sustainability. Conclude by completing a case study with your students, exploring a real-world situation, and applying their learning by explaining the scenario (eg: the reintroduction of wolves to Yellowstone National Park).

Big Idea(s):
FNMI ways of knowing and traditional knowledge help us to understand our environment
The living and non-living components within a given ecosystem interact in predictable ways
Coding and computational thinking can be used to allow us to gather data about various environmental conditions, which can inform how we interact within our environment
Students can use their learning to study and explore real-world problems through case studies

Strands & Expectations (in addition to the Strand A expectations listed at the beginning of this document):
Strand A: STEM Skills and Connections
A1.1 use a scientific research process and associated skills to conduct investigations
A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes
A2.1 write and execute code in investigations and when modelling concepts, with a focus on planning and designing programs
A2.2 identify and describe impacts of coding and of emerging technologies, such as artificial intelligence systems, on everyday life, including skilled trades
A3.3 analyse contributions to science and technology from various communities

Strand B: Life Systems
B1.1 assess the impact of various technologies on the environment
B1.2 assess the effectiveness of various ways of mitigating the negative and enhancing the positive impact of human activities on the environment
B1.3 analyse how diverse First Nations, Métis, and Inuit practices and perspectives contribute to environmental sustainability

B2.1 explain that an ecosystem is a network of interactions among living organisms and their environment
B2.2 identify biotic and abiotic components in an ecosystem, and describe the interactions between them
B2.3 describe roles and relationships between producers, consumers, and decomposers within an ecosystem
B2.4 describe the transfer of energy in a food chain, and explain the effects of altering any part of the chain
B2.5 describe how matter is cycled within the environment, and explain how the cycling of matter promotes sustainability
B2.6 explain the differences between primary succession and secondary succession in ecosystems
B2.7 explain how biotic and abiotic factors limit the number of organisms an ecosystem can sustain
B2.8 describe how different approaches to agriculture and to harvesting food from the natural environment can impact an ecosystem, and identify strategies that can be used to maintain and/ or restore balance to ecosystems

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
October November	**A1.1** Research various ecosystems found locally, regionally, and globally. **A1.1** Research how different biotic and abiotic components found within a given ecosystem interact with one another. **A3** Research local invasive species, noting their impacts and ways to repopulate native species and relating your learning to SDGs 14 (Life Below Water) and 15 (Life on Land). Some students may require direct support in setting up a research organizer and may	How do environmental conditions affect/impact the organisms that live within it? How do different biotic and abiotic components interact within an ecosystem? How do invasive species get introduced to an ecosystem? How do they affect/impact the native species within that ecosystem? How is matter cycled within the environment, and how can understanding the cycling of matter promote sustainability? How can we collect data on various environmental conditions? How can we analyse and understand our gathered data? Consider a case study exploring	**Language** Science journals for students to communicate their understanding could be used year-long **Geography** Constructing maps for various purposes. To support students at all levels, some may simply record relevant observations on their maps while others may begin to note connections between their observations, using a cause and effect model. **Math** Create an infographic on the cycling of matter Create computational representations using coding	Natural Curiosity: The Importance of Indigenous Perspectives in Children's Environmental Inquiry Canadian Geographic Educator Resources Perimeter Institute - Tools For Teaching Science	Think ahead to upcoming lab investigations and begin to gather any necessary supplies/materials Continue to gather supplies for build projects - found materials, recyclables, purchase new materials Begin to connect with guest speakers, presenters, or locations for outings for future lessons When looking to book outings, be sure to take into account accessibility and relevance

	benefit from being provided a specific invasive species to research, along with 1-2 vetted links. Other students may be more comfortable with independent research.  **A1.1** Explore FNMI ways of knowing and how they inform the understanding of interactions within local ecosystems.  **A1.2** Design and build a representation of a chosen ecosystem, noting the interaction between biotic and abiotic components This could be created in a virtual environment (Minecraft, Roblox, CoSpaces, etc.) or built using found materials. Some students may be working at a level where they are able to identify biotic and abiotic components within their chosen ecosystem. Others may begin exploring the connections between those identified components. As a stretch, some students may be pushed to consider the wider impacts on an	interactions between biotic and abiotic components within a given ecosystem. Ex: The reintroduction of wolves to Yellowstone National Park	Data collection, organization, and visualization		

	ecosystem when components within a food chain are altered. To support students at all levels, and to be conscious of available materials and technology, allow students to work in a medium that they are comfortable with. Some students may be more comfortable working virtually while others may wish to build a physical model or create a drawing as their representation. **A1.5** Communicate an understanding of the cycling of matter within the environment, possibly through the creation of an infographic. Examples of infographics can be found through Canadian Geographic's Educator Resources **A1.3** Design and build devices to collect data on various environmental conditions. Expectations can vary depending on what data is being collected and how it is analysed.				

	Ex: the data research station from the Perimeter Institute's unit "Temperature Rising"  **A2** Code devices to collect data on various environmental conditions. Expectations can vary depending on what data is being collected and how it is analysed. Some students may begin by remixing existing code and redesigning it to gather data for pre-determined environmental conditions. More advanced coders may work toward creating their own code, designed to gather data for various environmental conditions, debugging issues within their code as they work. Some students may be further stretched to create code that monitors various data either simultaneously or in real time. Students could be provided the option of which coding language to work in - some may work in blocks, while others may wish to work in JavaScript or Python, etc.				

	A1.5 Analyse gathered data, communicating findings. Expectations can vary depending on what data is being collected and how it is analysed.				

Overview:
These months will be spent learning about the particle theory of matter and how it informs our knowledge of materials and how they are used. When evaluating the success of these designs, code a microcontroller to record temperature data to compare results quantitatively. Explore how students can use their knowledge of particle theory to design a structure that is designed to retain heat, leveraging their understanding of various methods of heat transfer. Investigate the differences between pure substances and mixtures, moving on to the use of key scientific vocabulary to further enhance those understandings. Explore the solubility of various substances, calculating the concentration of various solutions and the solubility of various solutes. Investigate different methods through which solutions can be separated into their constituent components. Explore the real-world phenomenon of urban heat islands and propose solutions, noting connections with the SDGs.

Big Idea(s):
Knowledge of heat transfers can be leveraged to suggest methods to retain heat and mitigate heat loss
Students can leverage their learning to suggest solutions to real-world problems
The particle theory can be used to explain the difference between pure substances and solutions
Solutions are made of constituent components and can be separated into those components using various separation methods

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

Strand C: Pure Substances and Mixtures
C2.1 demonstrate an understanding of the particle theory of matter
C2.2 use particle theory to distinguish between pure substances and mixtures
C2.3 distinguish between homogenous and heterogenous mixtures
C2.4 use the particle theory to describe how different factors affect the solubility of a substance and the rate at which it dissolves
C2.5 describe the concentration of a saturated solution in both qualitative and quantitative terms, and differentiate between saturated and unsaturated solutions
C2.6 explain why water is referred to as the universal solvent
C2.7 explain various processes used to separate mixtures, including solutions, into their components, and identify some applications of these processes
C2.8 describe pure substances as elements and compounds consisting of atoms and combinations of atoms

Strand E: Heat in the Environment
E1.1 assess the social and environmental benefits of technologies that reduce heat loss in enclosed spaces or heat transfer to surrounding spaces

E1.2 analyse various social, economic, and environmental impacts, including impacts related to climate change, of using non-renewable and renewable sources of energy
E2.2 demonstrate an understanding of various ways in which heat is generated

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
December	**A1.2** Conduct experiments to identify various substances, employing the scientific experimentation process. (e.g., water vs. sugar water, sand, salt, Epsom salt, Alka Seltzer, baking soda, cinnamon, etc.) **A1.2** Classify various substances as pure substances, mechanical mixtures, or solutions based on their physical characteristics. **A1.5** Communicate an understanding of the differences between pure substances and mixtures, possibly through the creation of an infographic. **A1.2** Conduct investigations into methods for separating	How can our knowledge of the properties of various materials be used to inform the design of a structure to retain heat? How can we distinguish between pure substances and mixtures? How can we distinguish between homogenous and heterogenous mixtures? What are some of the factors that affect how the solubility of various substances and the rate at which they dissolve? What are the processes through which various mixtures can be separated into their constituent pure substances? What can the phenomenon of an urban heat island help us understand about heat retention?	**Math** Data collection, organization, and visualization regarding heat retention and loss Coding, solving problems using coding, and reading and altering existing code while using microcontrollers to gather temperature data Create an infographic **Language** Generate, gather, and organize information to write for an intended purpose (communicate an understanding of pure substances and mixtures)	Ontario Science Center STEM Toolkit Perimeter Institute's unit "Temperature Rising"	After the Winter Break, review lab safety protocols with students Review how to follow a lab procedure and how to record good observations in observation journals Review how to analyse gathered data Continue to gather supplies for build projects - found materials, recyclables, purchase new materials

	various mixtures into their constituent pure substances.  **A1.3** Design, build and evaluate a model thermos, designed to retain heat and mitigate heat loss, employing the engineering design process. Provide scaffolded templates to support students in this research. Some students may be at a level where they are able to identify areas of heat loss within a thermos. Others may be able to compare and differentiate areas of heat loss both qualitatively and quantitatively. Some students may be pushed to explore methods to further mitigate heat loss within a thermos. Remind students that the engineering design process is cyclical and remember that not all students will make it through all steps individually. Some will require additional support, especially in the prototyping, testing, and iterating phases. Some students may be pushed to explore their prototypes deeply and improve their initial designs through testing, revision, and				

	iteration. Encourage reflection by all students throughout the process to best assess their learning and takeaways throughout the process, regardless of advancement through the phases.  **A1.2** Gather and analyse data on heat retention and loss.  **A2** Code a microcontroller, such as a micro:bit to gather temperature data, possibly to be used during investigations.				

Overview:
The UN's SDGs provide an excellent lens through which our students can explore real-world problems and generate empathetic solutions using the engineering design process. Use these months as an opportunity to apply their learning thus far to a series of real-world problems and suggest solutions. Reinforce the steps of the scientific experimentation process and engineering design process cycles, and push your students to prototype, revise, and iterate their proposed solutions. Explore the ideas of innovation and invention as your students generate new ideas. Research various education and career pathways, noting the applicability of STEM skills throughout, encouraging all students to continue engaging with STEM throughout their education and career pathways. Create code that could be used to automate various aspects of your students' innovative solutions.

Big Idea(s):
Students can develop innovative solutions to real-world problems
Real-world problems are best explored through the empathetic lens of the UN's SDGs
Coding and computational thinking can be used to automate aspects of new and innovative designs
STEM skills are applicable across a wide range of education and career pathways

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

Strand C: Pure Substances and Mixtures
C2.1 demonstrate an understanding of the particle theory of matter

C2.2 use particle theory to distinguish between pure substances and mixtures

Strand E: Heat in the Environment
E1.1 assess the social and environmental benefits of technologies that reduce heat loss in enclosed spaces or heat transfer to surrounding spaces
E1.2 analyse various social, economic, and environmental impacts, including impacts related to climate change, of using non-renewable and renewable sources of energy
E2.1 use particle theory to explain how heat affects the motion of particles in a solid, a liquid, and a gas
E2.2 demonstrate an understanding of various ways in which heat is generated
E2.3 use particle theory to explain the effects of heat on volume in solids, liquids, and gases, including during changes of states of matter
E2.4 explain how heat is transmitted through conduction, and describe natural processes that are affected by conduction
E2.5 explain how heat is transmitted in liquids and gases through convection, and describe natural processes that depend on convection
E2.6 explain how heat is transmitted through radiation, and describe the effects of radiation from the Sun on different kinds of surfaces
E2.7 describe the role of radiation in heating and cooling Earth, and explain how greenhouse gases affect the transmission of radiated heat through the atmosphere
E2.8 identify common sources of greenhouse gases, including sources resulting from human activity, and describe how humans can reduce emissions of these gases

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
January February	**A1.3** Use the engineering design process to identify a local, regional, or global issue that is connected to one or more of the SDGs, and propose a creative solution to that problem **A.2** Develop code that could be used to automate some of the processes involved in the creation of your proposed solution	**Science Innovation to solve problems** **Guiding Questions:** Why is it important to learn about the UN sustainability goals? When exploring connections to the SDGs some students may only be working at a level where they are able to identify overlap between their work and relevant SDGs. Other students may be pushed to explore those connections more deeply while others still might be stretched to think about ways in which current practices could be adjusted to mitigate negative impacts or foster positive impacts.	Strand B-E expectations covered will be dependent on the goals focused on by the class. Suggest goals tie into the Grade 7 curriculum include goals 13, 14, or 15 **Media Literacy** Create a slideshow to “pitch” their prototype	Perimeter Institute - The Power of Innovation Perimeter Institute - What It Takes to Innovate	

	A.3 Research some of the careers and skilled trades that might be involved in further developing your proposed solution, noting the STEM skills that they would leverage in doing so	How do the goals connect to issues we are facing in Canada? Can we create an invention to tackle one of the problems we have learned about?			

Overview:
Return to your discussions about the environment from earlier this year, and further explore how humans impact and affect their surrounding environment both positively and negatively. Connect these discussions to the UN's SDGs. Discuss ways in which FNMI ways of knowing and traditional knowledge contribute to understandings of environmental sustainability. Begin exploring how agricultural techniques impact and affect various ecosystems. Understand that when designing structures, function follows form. Use this understanding to design a structure to serve a specific purpose, leveraging the engineering design process.

Big Idea(s):
Humans impact their environments in both positive and negative ways
FNMI ways of knowing and traditional knowledge contribute to understanding methods of environmental sustainability
When designing structures, function follows form
Structures can be designed to serve a specific purpose

Strands & Expectations (in addition to the Strand A expectations listed at the beginning of this document):
Strand A: STEM Skills and Connections
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
A1.4 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
A3.1 describe practical applications of science and technology concepts in various occupations, including skilled trades, 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

Strand B: Interactions in the Environment
B1.1 assess the impact of various technologies on the environment
B1.2 assess the effectiveness of various ways of mitigating the negative and enhancing the positive impact of human activities on the environment
B1.3 analyse how diverse First Nations, Métis, and Inuit practices and perspectives contribute to environmental sustainability

B2.8 describe how different approaches to agriculture and to harvesting food from the natural environment can impact an ecosystem, and identify strategies that can be used to maintain and/or restore balance to ecosystems

Strand C: Pure Substances and Mixtures
C1.1 analyse the social and environment impacts of the use and disposal of pure substances found in technological devices, considering local and global perspectives
C1.2 assess environmental and social impacts of different industrial methods used to separate mixtures

Strand D: Structures and Mechanisms
D1.1 evaluate environmental, social, and economic factors that should be considered when designing and building structures to meet specific needs for individuals and communities
D1.2 evaluate the impact of the ergonomic design of various tools, objects, and work spaces on a user's health, safety, and ability to work efficiently, and use this information to describe changes that could be made in their own spaces and activities
D2.1 classify structures as solid structures, frame structures, or shell structures
D2.2 describe ways in which the centre of gravity of a structure affects the structure's stability
D2.4 describe the role of symmetry in structures, and identify instances of symmetry in various structures
D2.3 identify the magnitude, direction, point of application, and plane of application of the forces applied to a structure
D2.5 describe factors that can cause a structure to fail
D2.6 identify the factors that determine the suitability of materials for use in manufacturing a product or constructing a structure
D2.7 describe methods engineers and other professionals use to assess, improve, and maintain the safety of structures

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
March April	**A1.1** Identify various ways in which humans affect/impact their natural environment. **A.3** Research how human activity is impacting SDGs 14 (Life Below Water) and 15 (Life on Land).	How do humans affect/impact their natural environment? How might we assess the effectiveness of various ways to mitigate the negative and enhance the positive impact of human activities on the environment? How do diverse First Nations, Métis, and Inuit practices and perspectives contribute to	**Math** Mathematical modelling (maximizing function while minimizing cost during a design build) **Language** Generate, gather, and organize information to write for an intended purpose (results of research conducted, impacts of AI technology on careers, etc.)	Vertical Farming Canadian Geographic Education - Climate Change and Food Security	If planning to build or plant a community garden, connect with relevant facilities personnel at your school in advance Connect with other members of the school community who may share the space to communicate needs and wants If planning to grow anything in a community

	A1.5 Communicate ways through which we can promote positive, and mitigate negative, environmental interactions. **A.3** Explore FNMI ways of knowing and practices and how they contribute to environmental sustainability. **A.3** Research and evaluate various agricultural and harvesting practices, exploring their impacts on the surrounding environment. **A1.1** Research mining and other processes for obtaining natural materials, exploring their impacts on the surrounding environment. **A3** Research how structural design can impact SDGs 9 (Industry, Innovation, and Infrastructure) and 11 (Sustainable Cities and	environmental sustainability? How do different approaches to agriculture and to harvesting food from the natural environment impact an ecosystem? How do we use structures to meet a need within a community? When designing a structure, how does function inform form?	**Geography** Describe human activities (oil sands mining) that create change in water bodies, vegetation patterns, and natural landscapes		garden, plant seeds well in advance in order to germinate them indoors to then be planted in the Spring

	Communities)  **A1.3** Build a structure that is designed to serve a specific purpose, employing the engineering design process. (e.g. designing and building a chair from recycled materials to meet the needs of a specific user). Some students may benefit from being provided a specific purpose around which to design a structure, while others may be able to identify a need on their own, around which they will design their structure. Encourage reflection by all students throughout the process to best assess their learning and takeaways throughout the process, regardless of advancement through the phases.  **A2** Research how coding and artificial intelligence systems impact the careers involved in designing and building a purpose-built structure.				

Overview:
Use these final months to bring your students' learning from the entire year together to explore the problem of designing and building a prototype greenhouse or community garden space.

Incorporate your students' understanding of human impacts on the environment, methods of heat transfer, and knowledge of form and function into the design of these structures. Leverage the UN's SDGs and follow the engineering design process of prototype, revise, and iterate innovative design solutions to this real-world problem. Examine the STEM skills that are used throughout and highlight relevant education and career pathways. When students are proposing their final design solutions, explore how they might use coding and computational thinking to automate some aspects of their design.

Big Idea(s):
Tie learning throughout the entire year together in a final project using the engineering design process
STEM skills are used in many aspects of learning and designing and are applicable to a multitude of education and career pathways
Students can propose innovative design solutions to solve real-world problems, leverage empathetic understanding of the UN's SDGs
Structures can be purpose-built to serve a specific purpose

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

Strand B: Interactions in the Environment
B1.1 assess the impact of various technologies on the environment
B1.2 assess the effectiveness of various ways of mitigating the negative and enhancing the positive impact of human activities on the environment
B1.3 analyse how diverse First Nations, Métis, and Inuit practices and perspectives contribute to environmental sustainability
B2.8 describe how different approaches to agriculture and to harvesting food from the natural environment can impact an ecosystem, and identify strategies that can be used to maintain and/or restore balance to ecosystems

Strand D: Structures and Mechanisms
D1.1 evaluate environmental, social, and economic factors that should be considered when designing and building structures to meet specific needs for individuals and communities
D1.2 evaluate the impact of the ergonomic design of various tools, objects, and work spaces on a user's health, safety, and ability to work efficiently, and use this information to describe changes that could be made in their own spaces and activities
D2.5 describe factors that can cause a structure to fail
D2.6 identify the factors that determine the suitability of materials for use in manufacturing a product or constructing a structure
D2.7 describe methods engineers and other professionals use to assess, improve, and maintain the safety of structures

Strand E: Heat in the Environment
E1.1 assess the social and environmental benefits of technologies that reduce heat loss in enclosed spaces or heat transfer to surrounding spaces
E1.2 analyse various social, economic, and environmental impacts, including impacts related to climate change, of using non-renewable and renewable sources of energy
E2.2 demonstrate an understanding of various ways in which heat is generated
E2.4 explain how heat is transmitted through conduction, and describe natural processes that are affected by conduction
E2.5 explain how heat is transmitted in liquids and gases through convection, and describe natural processes that depend on convection
E2.6 explain how heat is transmitted through radiation, and describe the effects of radiation from the Sun on different kinds of surfaces

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
May **June**	**A1.1** Research various greenhouse or community garden designs and note how they are designed to meet the needs of their users. **A.3** Research and evaluate how SDGs 2 (Zero Hunger), 3 (Good Health and Well-Being), and 11 (Sustainable Cities and Communities) would inform the design of a greenhouse or community garden. **A1.3** Design and build a structure to support the germination and growth of seeds of native species of plants. This could be created in a virtual environment (Minecraft, Roblox, CoSpaces, etc.) or built using recycled or new materials. **A1.1** Explore FNMI ways of knowing and practices and	How might we use our learning from the year to design and optimize a prototype greenhouse or community garden space? How does the function of a greenhouse or community garden space inform its design and form? How can we apply our understanding of the interactions between biotic and abiotic components within an ecosystem to the design of a prototype greenhouse or community garden space? How can we apply our understanding of heat transfers and heat retention to the design of a prototype greenhouse?	**Geography** How climate change impacts natural events and/or human activities Describe human activities that create change in water bodies, vegetation patterns, and natural landscapes **Math** Mathematical modelling (maximizing function while minimizing cost during a design-build) Coding, solving problems using coding and reading and altering existing code while using microcontrollers to automate design **Language** Generate, gather and organize information to write for an intended purpose (results of research conducted, etc.) **Student Success** Career research & exposure to the skilled trades	Skills Ontario - Consider booking a virtual or in-person presentation on the skilled trades Ontario Youth Apprenticeship Program ChatterHigh - College and Career Exploration	Consider weather during the last few months of the school year When will you be most able to conduct lessons or build projects outdoors?

	how they inform the growth and use of food sources.  **A2** Code a microcontroller such as a micro:bit, or similar device, to automate part of your design to optimize environmental conditions for germination and growth of seeds.  **A1.1** Research various careers and how they might leverage STEM skills and understandings. It is important to ensure that our students are exposed to, and learn about, a variety of different post-secondary education and career pathways. Be conscious of the background of your students and prepare examples that show various career and trade pathways that are reflective of your students' background and experience. Encourage your students to explore career pathways that follow various post-secondary education opportunities as well as apprenticeships.				