Long-Range Model 2 - Grade 6

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, Best Practice and Assessment Ideas:

Educators will be able to introduce and integrate Biodiversity 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 6.

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

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

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

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

Reflective Questions when Planning:

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

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

B. Life Systems: Biodiversity

B.1 Relating Science and Technology to Our Changing World: assess the importance of biodiversity, and describe ways of protecting biodiversity

B1.1 assess the benefits of biodiversity and the consequences of the diminishing of biodiversity

B1.2 analyse a local issue related to biodiversity while considering different perspectives; plan a course of action in response to the issue; and act on their plan

B.2 Exploring and Understanding Concepts: demonstrate an understanding of biodiversity, its contributions to the stability of natural systems, and its benefits to humans

B2.1 describe the distinguishing characteristics of different groups of organisms, and use these characteristics to further classify these organisms using a classification system

B2.2 demonstrate an understanding of biodiversity as the diversity of life on Earth, including the diversity of organisms within species, among species in a community, and among communities and the habitats that support them

B2.3 describe ways in which biodiversity within species is essential for their survival

B2.4 describe ways in which biodiversity within and among communities is essential for maintaining the resilience of these communities

B2.5 describe interrelationships within species, between species, and between species and their natural environment, and explain how these interrelationships sustain biodiversity

B2.6 explain how invasive species reduce biodiversity in local environments

B2.7 explain how climate change contributes to a loss of biodiversity, and describe the impact of this loss

B2.8 describe the importance of biodiversity in supporting agriculture, including Indigenous agriculture around the world

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
September **October** **November**	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.  **A1.2, A1.4** Students conduct a population survey looking for, and identifying, various species found in a given area (transect).  **A1.1** Students build and design their own digital biome showing their species and their relationship with the natural environment.  **A1.1, A.2** Students can design their own habitat or landscape with a coding platform.  **A1.1, A1.3, A1.4** Students design their own biome in a makerspace environment using approved materials while classifying species.  **A1.1**	What are some unique species that live in specific or unique biomes on Earth? What is biodiversity and how is it connected to our daily lives, locally, nationally, or globally? What are some classifications for different species? What is the relationship between species and their environment? What type of species and environments can you find locally, across Canada, and globally? Why does the well-being of biodiversity around Canada and the world affect us? How does human activity affect the biodiversity around us? What are some causes and consequences of environmental damage to our society and other communities around the world? What are some positive initiatives that are conducted by Canadian citizens, organizations, or global citizens that are working to support the needs of an endangered or near extinction species? Why is it important for our environment?	**Math** Students use math to complete activities in the tree study and use measurement when studying a population of a particular area. Students also use math skills when analysing data for various biodiversity issues. **The Arts** Students use a variety of leaves around their school and use a variety of arts and crafts to use a rubbing technique on any type of coloring paper. This can be extended to drawing larger trees, species, or anything related to Biodiversity. **Health and Physical Education** Students go outside for a small walk around their schoolyard, or nearby park. Students can explore the variety of species they discover (plants vs animals) and keep a tally of what they find.	Find a digital platform that allows students to showcase their biomes digitally or find an online ecosystem simulator. This is an online activity by Canada Learning Code about Wildlife Soundscapes and another example Interactive Habitats & Communities that incorporates coding and emerging technologies. Find a local biodiversity issue or find resources that discuss the meaning of sustainability in biodiversity and the environment THE 17 GOALS | Sustainable Development (bilingual link) Find resources that discuss the importance of biodiversity, nature, and the environment for Indigenous communities	**First Steps**: STAO Safety in Elementary Science and Technology Be sure to review safety guidelines for all experiments and activities and instruct students to follow safety guidelines. Collecting numerous arts and crafts materials, plasticine or playdough is helpful for hands-on creation. Collecting recycling materials, and makerspace materials are also helpful when planning for building and creating. Having access to digital resources or non-digital resources that explain biodiversity locally, nationally, and globally. Having students bring in outdoor education supplies such as umbrellas, clipboards, and notebooks or collecting these items for use during outside lessons is helpful.

	Students research and explore how certain species provide us with day-to-day items which we use or eat and their impact on society and day-to-day tasks.  **A1.1, A1.5** Students research and investigate local or global environmental issues that have an impact on species and human activity, examples can include invasive species, microplastics, habitat loss, deforestation, etc., and prepare a media presentation about what they have learned to share with the school community.  **A1.1, A1.4, A1.5** **Canadian Species At Risk Projects** Students study and research the needs and habitats of a Canadian species at risk. Students identify factors contributing to the decline of the species, including climate change and invasive species, and design possible solutions to those problems (e.g., animal road crossings, plastic collectors in rivers, etc.) and build and test models if possible. Students communicate their findings by sharing models of their solutions	How can we protect our local, national, and global endangered species and biodiversity for future generations?	Students can play a game of Freeze Tag while acting as their favorite species. **Language Arts** Students read, explore and write argumentative texts or small group discussions or speeches that talk about climate change, endangered species, invasive species, and human displacement. Allow students to be curious and passionate about a biodiversity topic, local, provincial, national, or even global topic. Students prepare a slideshow presentation about an animal of their choice, including information such as animal classification, habitat, endangered status, etc. **Social Studies (*B2 and B3)***: Students can research and investigate a global environmental issue and concern, for example how are Canadian organizations protecting Monarch migrations to the south, and how are Canadian organizations helping to fight climate change.	Organize a field trip to a local conservation area. Invite a guest speaker, parent, or community member who studies, explores, and works in either the biodiversity field or species conservation (virtual invite or in-person invite). If possible, invite a beekeeper to share about work in his/her skilled trade. Earth day, Earth Hour, and other important inclusive calendars that incorporate the importance of biodiversity take place during this time. Reach out to your school board Indigenous education team for further details. Find coding resources that incorporate STEM activities like this micro:bit activity Resources to support outdoor learning and opportunities for teacher training. *Project Wild* by Canadian Wildlife Federation.	**Next Steps:** Tree or garden planting can be planned in the fall and implemented in the spring. Another option is to plant certain species in the fall for spring/summer harvest such as garlic, asparagus, and rhubarb in a school garden. Some trees do better when planted in the fall as well. Register your school with Ecoschools Canada to get certification! It has lots of great resources that tie into all of the great things you will be doing in Grade 6 biodiversity and global issues.

	 **A1.1, A1.3, A1.4** Students research, plan, design, and build a home for a Canadian species to enhance their habitat (e.g. bat box, bee house, insect home, butterfly feeder, bird house/feeder).  **A1.1, A1.5** Students create a timeline about an issue in biodiversity that investigates: Who/What: is the event about When: the date when the event happened Where: (country) it happened Why: is it important to Biodiversity An illustration, graphic, or picture of the event or species involved is created using various options, such as media works like posters or presentations.  **A1.1, A1.3, A1.4, A1.5, A.2** Students design and build a game (coded, electronic or board) that teaches others about biodiversity.		Students can research how the protection of Canadian agriculture is important to Canada's economy and worldwide. Students investigate actions and consequences of flooding of traditional Indigenous hunting and gathering areas as a result of dam construction. The population of bees is being reduced, and students investigate the local and global impact of beekeeping. This can tie into the *Save the Pollinators Project*. UN Sustainability Goals Connections Projects- students choose to study real-world problems and solutions, such as organic farming, habitat restoration projects, controlling microplastics, Ontario Species at Risk Act, etc., and investigate how the current UN Sustainability Goals are being addressed in Canada and the world to improve biodiversity. Students investigate First Nations, Metis, and Inuit peoples' solutions to	The Learning for a Sustainable Future website includes many resources for outdoor learning and the UN sustainability goals and action project funding opportunities. 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 Lesson plans about sustainability and global issues can be found at The World's Largest Lesson.	

	 **A1.1, A1.3, A1.4, A1.5, A.3** **Save the Pollinators Project** Students study the role of local pollinators (butterflies, moths, bees, birds) and their role in biodiversity, as well as how invasive species and climate change are affecting pollinators. Students create food webs including pollinators. Students design a pollinator garden that could be implemented at school or built as models, taking specific needs of pollinators and native plant species into account for the designed habitat. Students communicate with the school community by creating posters of creating pollinator-friendly gardens using student findings  **A1.1, A1.4, A1.5** **Tree Study**: Students choose a tree in their schoolyard or community. They take pictures of it in fall, winter, and spring, and collect data on it such as its approximate height (use thumb rule), the number of leaves, approximate age (using circumference), and any wildlife living on or near it. Students research why trees are important for biodiversity and present what		biodiversity issues. Students create a media work of their findings and/or create local action projects to address local biodiversity issues. **Cross-strand Lessons** Discover the future of tech with flights, jets, human impact of flights on climate change; students investigate why engineers use similar traits of a flying insect, bird, or mammal when studying flight **Build a Bird Inquiry** Students research the special adaptations of birds and other flying animals which allow them to fly. Students design, build and test a flying contraption that uses the principles of flight to fly across a specific distance (e.g., 10 m). Students make alterations to their contraptions to conduct experiments on ways to change flight direction and speed. Students compare their flying models to flying animals and describe similarities and differences **(Strand B + D)** Discover and explore certain plants, animals, and other species that have flight		

	they have learned about their tree and biodiversity in media works to the school community.		features in their environment (helicopter seeds, flying squirrel (Strand **B+D)** Explore the impact of the numerous green energy (renewable) sources and energy consumption on biodiversity **(Strand B+C)** Discover why astronauts are exploring growing plants in Space (Strand **B+E)** **Living Space Project with Let's Talk Science** *Growing Plants in Space Inquiry* Students research the basics of growing plants without soil (as on the Moon and Mars) and compare different technologies such as hydroponics and aquaponics. Students design, build and test devices that will grow plants successfully using UV lights or sunlight, and without soil (grow towers, other constructed devices); students communicate their findings by creating media works to inform others of the pros and cons of hydroponics in space (**Strand B and E**)		

Strands & Expectations: (in addition to the Strand A expectations listed at the beginning of this document):
C. Matter and Energy: Electrical Phenomena, Energy, and Devices

C.1 Relating Science and Technology to Our Changing World: evaluate the impact of the use and generation of electrical energy on society and the environment, and suggest ways to use electrical energy responsibly
C1.1 assess the short- and long-term impacts of electrical energy generation technologies in Canada on society and the environment, including impacts on First Nations, Métis, and Inuit communities, and on climate change
C1.2 assess choices that reduce personal use of electrical energy from both renewable and non-renewable sources, and advocate for the responsible use of electrical energy by the school community

C.2 ***Exploring and Understanding Concepts*** demonstrate an understanding of the principles of electrical energy and its transformation into and from other forms of energy
C2.1 explain commonly observed electrostatic phenomena, using the principles of static electricity
C2.2 describe current electricity, and compare and contrast current electricity with static electricity
C2.3 identify materials that are good conductors of electric current and materials that are good insulators
C2.4 describe how technologies transform various forms of energy into electrical energy
C2.5 describe ways in which electrical energy is transformed into other forms of energy
C2.6 explain the functions of the components of a simple electrical circuit
C2.7 distinguish between series and parallel circuits, and identify common uses of each type of circuit

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
November December January	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.  **A1.2, A1.4** Students can demonstrate the differences between parallel and series circuits by using electrical materials provided by the school.	What are the main functions of a simple electrical circuit? What are some of the components that are required? What is the difference between parallel and series circuits? What makes static electricity? What are some energy transformations that generate electricity to be used in our	**Math** Students use online circuit simulation or coding activities to investigate and demonstrate the functions and components of electrical circuits. Students use logical thinking and problem-solving skills when completing electrical STEM activities. **Math** Students can create and	Find online simulation or coding platforms (e.g. MakeyMakey or micro:bits) that allow students to identify types of circuits and their functions. Resources for calculating energy use and footprint can be found on the Ecoschools Canada website	**First Steps**: Be sure to review safety guidelines for all experiments and activities and instruct students to follow safety guidelines. Locate electricity kits and locate materials to build circuits including batteries, wires, lights, motors, etc. Teachers should also collect

	A1.2, A1.4 Students can predict and investigate the effects of certain insulators or conductors on a simple circuit. **A1.1** Students can identify objects around the classroom or their household that utilizes either series or parallel circuits. **A1.3, A1.4** Students design, build, and test vehicles (boats, cars) powered by static electricity. **A1.3, A1.4** Students design, build, and test a battery-powered vehicle for space exploration (Mars Rover). **A1.2, A1.3, A1.4** Students design, test and build a vehicle powered by alternative energy (e.g., wind-powered car or boat). With teacher direction, vehicles can be designed and tested for speed or distance (record fair test results) to get the best results.	society? What are some renewable or non-renewable energy sources that are found in our society or globally? What are some short-term and long-term impacts of electrical energy technology? What are some responsible methods and ways that allow society to use energy responsibly?	analyse graphs about energy consumption in Canada, the world, and also in their school by conducting a school energy audit. **Money and Finances** Students can identify financial goals that can be achieved or impacted by energy consumption. **Language Arts** Students investigate the pros vs cons of types of energy creation. Students can show their learning by conducting debates, writing persuasive reports, or making media works. Students research human impact on energy consumption with a lens on climate change. Students communicate their learning by creating media works. Students use their vocabulary of types of insulators and conductors that we see in our classrooms or school and other electricity-related terminology. Students study the types of lamps that can be used, their	The Learning for a Sustainable Future website includes many resources for outdoor learning and the UN sustainability goals and action project funding opportunities. 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 Find resources that showcase the various types of energy transformation, its impact on society, and the environment, and the many renewable or non-renewable energy sources. An example is the Ingenium Energy and Climate 101 resource. Find resources that discuss the impact, cause, consequences, and relationships of the energy	recyclable items to be used for makerspace activities such as building wind or water turbines or space robots. **Next Steps:** Teachers can organize an arcade-style carnival STEM activity, in which students can use a variety of resources to design and create board games or challenges that contain simple electrical circuits. Find materials that can go along with this STEM challenge (e.g. wires, batteries, coding platform, alligator snaps, cardboard, aluminum tinfoil, coins). **Extension** Students can design Daily Physical Activity challenges with a coding platform like Scratch to create a fun movement activity with the on-screen option ((french) or find a coding activity similar to this micro:bit stepcounter lesson. (french) **Extension**: find resources that allow students to explore how electrical circuits, AI, and simple coding, allow engineers to program automatic devices

	A1.3, A1.4 Students design, build and test an electronic game (buzzer style, or light-up answers). **A1.3, A1.4** Students design and build Wigglebots or other similar electrical devices using offset motors, wires, batteries, tape, and other objects. The devices use an offset motor and gears to wiggle around and can be used to draw or race. **A1.1, A1.3, A1.4** **Building a Space Robot** Students research robotics, the use of robotics in flight and space missions, and how robots can be used to perform simple functions to help humans; students design, build and test a 'space robot' that uses a battery, wires, and either lights, buzzers, and/or motors as well as recycled items, dowels, gears, wire, tape, etc. to move, light up, and/or make sounds and perform a simple task without human assistance; students describe how their robot could help on space missions.		benefits and impact on energy consumption, and the history of using oil lamps in First Nations, Metis, and Inuit as well as early Canadian settlements for heat and light. Students research and make a list of as many skilled trades related to electricity as they can. Students can choose one and research the career path to that trade. **Social Studies** Students research the history of electric power in Canada and its contribution to society and compare renewable and non-renewable energy production in Canada. Students investigate global consumption and production of energy and learn of Canada's role in this global issue. Sustainability goals with the UN can be addressed here as well. James Bay Project | The Canadian Encyclopedia Students learn about the impact of this hydroelectric power plant on Indigenous communities.	sector on indigenous lands and communities. Pikangikum First Nation Connected to Ontario Power Grid Wataynikaneyap Power Lesson plans about sustainability and global issues can be found at The World's Largest Lesson.	and other technological devices that are used daily in our society (e.g. lights, AC, heater). You can replicate it with a variety of hands-on or digital coding resources (Strand A+C) There are some great examples by Canada Learning Code.. Invite a guest speaker, parent, or community member who studies, explores, and works in power plants, HydroOne, or other fields related to energy (e.g. skilled trade such as an electrician).

	 **A1.1, A1.2, A1.3, A1.4, A1.5, A.3** **Wind and Water Turbine Investigation** Students research how turbines are used in almost all ways of making energy (nuclear, coal, water, wind, tidal, etc.). Students design a wind or water turbine by examining different models and build it using various materials. Students test their turbines and examine the pros and cons of using wind or waterpower. Students communicate their findings by creating media works		**Cross-strand Lessons** Explore the impact of the numerous green energy and energy consumption on biodiversity in Canada. (**Strand B+C)**		

Term 2 - Overview, Guidelines, Best Practice, and Assessment Ideas:
Educators will be able to connect strands D and E with technological timelines, Canada's contribution to the world, local impact of technology innovations on the environment and society in general. Students will be able to explore and investigate local, provincial, and even global challenges which will incorporate some of the big ideas from the first term in this LRP. As well, the grade 6 Social Studies expectations are easily connected in this term which opens up many opportunities to integrate other cross-curricular lessons and activities to strengthen the learning and understanding of the students.

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

D1. Relating Science and Technology to Our Changing World: assess the environmental impacts of flying machines
D1.1 Assess the impacts on society of aviation technologies while considering both local and global perspectives

D2. Exploring and Understanding Concepts: demonstrate an understanding of the ways in which properties of air can be applied to the principles of flight and flying machines
D2.1 identify flight-related applications of the properties of air
D2.2 describe the relationships between the four forces of flight – lift, weight, thrust, and drag – that make flight possible
D2.3 describe ways in which flying machines and various organisms use balanced and unbalanced forces to control their flight154
D2.4 describe ways in which the four forces of flight can be altered
D2.5 describe characteristics and adaptations that enable organisms to fly

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
February March April	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.  **A1.2, A1.3, A1.4** Incorporate STEM activities and experiments to allow students to investigate the properties of air which allows students to develop skills needed to understand the concept of air properties in relation to flight. Examples: air has mass, hot air rises, etc.  **A1.2, A1.3, A1.4** Students participate in STEM activities and experiments related to basic flight properties and the four forces of air, such as blowing over a piece of paper under their lower lip to show how lift works.  **A1.2, A1.3, A1.4** Students can design and investigate the forces of flight by creating a variety of paper airplanes that can perform different functions such as flying the farthest, hitting a target, and/or doing a trick.	What are some properties of air that can be applied to flight-related applications? How does air occupy space? How does air possess a mass? How does air contract and dilate? How does air exert a force? How does air compress? How does air act like an insulator? What are the four forces of flight that make flight possible? (lift, weight, thrust, and drag) Which forces can be altered to modify flight patterns? What are the relationships between the four forces of flight? What is Canada's contribution to aviation innovation and technology (past, present, and future) What types of species use forces similar to flight? What are some similarities and differences in controlling their flight? What allows a hummingbird to stay immobile while controlling its flight?	**Mathematics:** Students collect data and analyse data during experiments and STEM challenges to draw conclusions. Students measure distances, weights, and heights to record data. **Math** Students are investigating and analysing numbers while designing their helicopter activity and other experiments. **Math** Coding can be explored by allowing students to use a variety of coding platforms to demonstrate and apply knowledge of properties of air, four forces of flight, and/or how altering forces can alter flight patterns **Math**: Students can utilize coding platforms to design and replicate various organisms	Find resources in your classroom or school to showcase the principles and properties of air. Find educational books that discuss the links between the properties of air and flight-related applications. Find digital books and digital interactive simulations that showcase the principles of air. Find resources such as books, novels, scientific journals, or comic books that explore Canadian history with flight machines or Canadian pioneers in flight technology. Find coding platforms or coding resources, such as the Canada Learning Code, *Canada Take Flight* lesson plan that incorporates flight properties.	**First Steps**: Be sure to review safety guidelines for all experiments and activities and instruct students to follow safety guidelines. Collect materials that may be needed such as balloons, jars, water, scale, and plastic syringes. If access to materials is limited, try using digital media to showcase the basic principles of air. Find and collect materials that can be used to create and design simple flight devices (paper, cardboard) Find materials such as paper, paperclips, scissors, rulers, glue, timers or stopwatches, measuring tapes, tissue paper, and plastic bags in order to create the helicopter/hot air balloon STEM activity, the parachute activity (Mars Lander) and the Build A Bird Activity.

	 **A1.2, A1.3, A1.4** Teachers can organize a variety of STEM challenges that allow students to use their flight devices to complete certain goals, such as: which one can stay in the air the longest? Which one can reach the furthest?  **A.2** Students can incorporate coding platforms to demonstrate the relationship between the four forces of flight.  **A1.1**, **A1.2, A1.3, A1.4** STEM activity that incorporates how various organisms use forces of flight in their environment, such as Build a Bird Inquiry in which students research the special adaptations of birds and other flying animals which allow them to fly. Students then design, build and test a flying contraption that uses the principles of flight to fly across a specific distance (example 10 m); students make alterations to their contraptions to conduct experiments on ways to change flight direction and speed; students compare their flying	What type of insects has unique flight patterns? What type of plant or leaf uses air properties to be transported by its unique shape and design What are some impacts of aviation technology on our society? Locally, how does an urban airport or rural airport affect local citizens, local species, and the environment? Globally, how do global numbers of aviation technology affect levels of carbon dioxide, water pollution, deconstruction of land and space, and other endangered species? What are some positive impacts of aviation technology on transporting medicinal and critical equipment to local or international areas? What type of aviation technology is critical for search and rescue? What are the benefits of aviation technology that support and contribute to the local and global economy via trades or tourism?	that use forces to control their flight. Students investigate and explore the design thinking process while applying math knowledge throughout these STEM challenges. **Language** Students research pioneers in flight technology or pilots such as Amelia Earhart, and the Wright Brothers and share their learnings by creating biographical media works or reports. Students research and make a list of as many skilled trades related to flight as they can. Students can choose one and research the career path to that trade. **Social studies** Students can explore, research, and investigate the history of Canadian innovation and technology in flying machines. **Social studies** Students investigate the contributions of aviation technology to the global environment, as well as the	Find novels or books that discuss how certain species have flight patterns and adaptations. Find a coding platform that will allow students to demonstrate the principles of flight with various organisms. Find resources that discuss the impact of aviation technology on local or global societies. The Learning for a Sustainable Future website includes many resources for outdoor learning and the UN sustainability goals and action project funding opportunities. 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	Students can go for a walk during the fall to explore certain grains or leaves that move through the air, and investigate properties of flight they have or don't have. Students can explore the impact or the future of drone technology on species, laws, and regulations, noise control, and/or delivery of critical equipment and medicine. **Next Steps:** Invite a guest speaker, parent, or a community member who studies, explores, and works in flight-related technologies or a pilot (virtual invite or in-person invite). If possible, invite an aircraft mechanic to share his/her skilled trade expertise. Prepare for Earth Day/ Earth Month/ Earth Hour by collecting work from previous units and displaying them. Participate in local environmental activities and have your class start some initiatives. Finish your Ecoschools Canada submission.

	models to flying animals and describe similarities and differences. (This may have been done previously in the biodiversity unit)  **A.2** Students can code a species that uses balanced or unbalanced forces to control their flight.  **A1.2, A1.3, A1.4** Students participate in a STEM activity that demonstrates flight patterns with helicopter and/or hot air balloon style principles.  **A1.2, A1.3, A1.4** Students build and test a rotary flight device, adding paper clips for weight. Students record and analyse data (graph) to determine the optimal weight for sustained flight.  **A1.1** Students can explore the impact or the future of drone technology on species, laws, and regulations, noise control and/or delivery of critical equipment and medicine.		safety or transportation of critical goods. Students also investigate how invasive species such as zebra mussels are moved from lake to lake by float planes. Students can also connect to other invasive species and how they have impacted Canada's natural environment. **Cross Strand Lessons:** Students investigate how aviation technology is increasing issues with the Earth's atmosphere and how First Nation, Metis, Inuit, and early Canadians have dealt with issues such as droughts, flooding, biodiversity loss, and other possible effects of climate change. Students share their findings by creating media works. **(Strand B + D)** Students explore numerous species from the animal kingdom and plant kingdom while investigating flight patterns and understanding how they control their flight (Build a Bird Investigation). **(Strand B + D)**		

	A1.1, A1.5 Students investigate the local and global impact of aviation technology on society by researching issues related to aviation and presenting their findings in media works such as posters or presentations.				

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

E1. Relating Science and Technology to Our Changing World: assess the impact of space exploration on humans, society, and the environment
E1.1 analyse the impact that conditions in space have on humans engaged in space exploration and explains how humans meet their social, emotional, and physiological needs in space
E1.2 assess the role of space exploration technology in observing and understanding environmental changes on Earth, including climate change
E1.3 evaluate the social and environmental impacts of space exploration while taking various perspectives into consideration

E2. Exploring and Understanding Concepts: demonstrate an understanding of the solar system, the phenomena that result from the movement of different bodies within it, and the technologies used in space exploration
E2.1 identify components of the solar system, including the Sun, Earth and other planets, natural satellites, comets, asteroids, and meteoroids, and describe their main physical characteristics
E2.2 distinguish between the concepts of *mass* and *weight*
E2.3 describe the relationship between the force of gravity and the weight of a body
E2.4 identify the types of bodies in space that emit light and those that reflect light
E2.5 describe various effects of the relative positions and motions of Earth, the Moon, and the Sun
E2.6 identifies various technologies used in space exploration, and describe how technological innovations have contributed to our understanding of space

Month or Suggested Timeline	STEM Skills and Connections	Guiding Questions	Cross-Curricular Integration	Resources	First Steps & Next Steps
April **May** **June**	**NOTE:** Teachers should choose from this list of STEM activities that best suits their students, school, and community.  **A1.2, A1.3, A1.4** Students design, build, and test a sundial.  **A1.1, A1.3, A1.4, A1.5** Students build models of the solar system, moon phases, and eclipses using a variety of objects in a makerspace environment, coding platforms, and/or digital design. Students present their models to their classmates and/or build them collaboratively.  **A.2** Students can code a simulation that will demonstrate an understanding of mass and weight on other planets, the Earth, and the Moon.  **A1.3, A1.4** Students design, build, and test a space vehicle (Mars Rover) to climb uneven surfaces efficiently	What are the main components of our solar system? What is some unique light-emitting scenery that can be seen that reflects certain light in the sky/space? How are weight and mass different on the Moon, and other planets and how do they compare to Earth's gravity? What is the relationship between the Moon, Earth, and the Sun? What are Canadian contributions to space exploration? How did those innovations impact society in various ways: Satellites to warn about climate change, warn about major weather changes, enhanced medical laboratories? What are some technological innovations that have contributed to society? What are some unique conditions that Canadian astronauts or international astronauts have to	**Language** Students research famous Canadian astronauts and pioneers of space flight technology and prepare biographies using media works or reports. Students research and make a list of as many skilled trades related to space as they can. Students can choose one and research the career path to that trade. **Data Literacy** Numbers are explored in these activities; chart tables and data analysis are explored and created during STEM activities. Students calculate their weight on different planets and objects in the solar system. Students measure angles during the sundial experiment. **Visual Arts** Students use techniques and forms to create models of the	Find digital or non-digital resources that identify major components of our solar system. Find online resources or books that showcase Aurora Borealis that can be seen in northern Canada Find books or any digital or non-digital resources that describe the relationships between forces of gravity, weight, and mass for the solar system Find coding platforms, such as this Canada Learning Code, Taking off with Scratch that incorporates coding with gravitational fields. Find resources that explain the various orientations of the moon with the earth and the sun. Find resources that explain how water levels in	**First Steps**: Be sure to review safety guidelines for all experiments and activities and instruct students to follow safety guidelines. Students may use arts and craft materials to display the solar system in a variety of methods, so you may need to find and collect. Students may require chalk, black coloring paper, and other arts and craft materials. Students may need some arts and craft materials to replicate the various phases of the moon, and the positions of the Moon with the Earth and the sun. **Next Steps:** Register the classroom for the Tomatosphere project with Let's Talk Science. Register the classroom for the

	(Lego Mindstorms/EV3 work well for this if possible for coding as well).  **A1.3, A1.4** Students conduct experiments to investigate gravity (record the speed with which various items fall to the ground from a given height).  **A1.1, A.2** Students complete computer simulations that investigate the weight and mass on different planets (Explore Learning Gizmos).  **A1.1, A1.3, A.1.4** **Satellite Investigation**: Students investigate the use of global satellites and their use in research and technology for helping us understand the effects of climate change and weather patterns. Students use data from NASA to investigate seal level rise and design, build and test models that show ice melt effects on sea level.  **A.2** Students can use a coding platform to recreate or simulate	adjust to meet their day-to-day needs during space exploration? Why are astronauts exploring gardening in outer space?	solar system, other models such as phases of the moon, etc. **Social Studies** *More than just Velcro Investigation* Students research various technologies that have been developed during preparation for space travel and how those technologies have helped humans on Earth as well. Students investigate the current issues surrounding space travel and possible habitation of the Moon and Mars, and debate which we should inhabit first based on research into resources, proximity to Earth, etc. Students communicate their findings by having a debate and/or writing persuasive arguments. Students also design, build and test their own Canadarm models using recyclable materials, balsa wood, syringes, tubing, or other approved materials. Students investigate the local First Nations, Metis, and Inuit ways of knowing about space, for example, the names of moon phases for each month's moon.	certain parts of Canada and globally can be affected by the moon's location and positioning with earth and the sun. Find digital or non-digital resources that discuss the history of Canadarm1 or 2 and beyond. For example, • Canadian Space Agency official site • Canada, a nation of space innovations Find resources that explain how NASA has helped redesign the digital ear thermometer. Find resources that explain how anti-shock sneakers were inspired by astronauts' special boots for the moon landing. Students investigate how water treatment and potable water were inspired by space technology, similar to what astronauts use in space. Find digital or non-digital resources that explain how astronauts eat, sleep and/or complete their	Living Space project with Let's Talk Science Living Space | Let's Talk Science. Invite a guest speaker, parent, or community member who studies, explores, and works in space-related technologies (virtual invite or in-person invite). Plant your garden or tree from Term 1.

	Canadarm. See the resources column for the link.  **A.2** Students can code the solar system with simple robotics, or a coding platform (for example using Scratch or Ozobots)  **A1.1, A1.4, A1.3, A.1.4** **Landing on Mars Inquiry** Students research how space missions have used different strategies to drop payloads on Mars. Students design, build and test parachutes or other devices to slow the descent of a 'space lander' made of an egg in a box designed to withstand impact and dropped from a determined height (e.g. 2m). Students communicate their findings by displaying their landers and discussing the positives and negatives of their design.  **A1.2, A1.3, A1.4, A1.5** **Rocket Investigation** Students design, build, and test rockets (bottle, straw, or other) and investigate how changes in nose weight, length, fin size, or shape affect flight; students		**Cross Strand Lessons:** Students investigate space technology that can predict environmental change and its impact on society (e.g., satellite investigation). **(Strand B + E)** Students study plants, agriculture, and their sustainability in space. Example: The Future of Growing Plants in Space: students research the basics of growing plants without soil (like on the Moon and Mars) and compare different technologies such as hydroponics; students design, build and test devices that will grow plants successfully using UV lights or sunlight, and without soil (grow towers, other constructed devices); students communicate their findings by creating media works to inform others of the pros and cons of hydroponics in space. (Living Space Project from Let's Talk Science) This may have been done previously with the Biodiversity unit. **(Strand B + E)**	scientific space research (for example, many lessons can be found on the official Canadian Space Agency site or on Chris Hadfield's YouTube channel). 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  The Perimeter Institute of Theoretical Physics has activities and resources for teachers about space.	

	connect their learning to aviation investigations about various plane designs (stealth, airbus, etc) and/or rocket development, past, and present (example Dragon X rockets versus early ones); students communicate their learning by creating media works		**Building a space robot** students research robotics, the use of robotics in flight and space missions, and how robots can be used to perform simple functions to help humans; students design, build and test a ‘space robot’ that uses a battery, wires, and either lights, buzzers, and/or motors as well as recycled items, dowels, gears, wire, tape, etc. to move, light up, and/or make sounds and perform a simple task without human assistance; students describe how their robot could help on space missions (this may have been done previously with the Electricity unit) **(Strand C + E)**		