Long-Range Plans
Science and Technology, Grades 1 to 8 (2022)

What is a long-range plan and why is it important?

The vision of the elementary science and technology curriculum is for students to acquire and develop the skills and knowledge they need to thrive in today's rapidly changing world. As discoveries and innovations in STEM increasingly impact our lives, science and technology continues to adapt and evolve. A central component of this curriculum is safe, practical, hands-on, experiential learning that will support students in becoming successful and discerning individuals who are scientifically and technologically literate.

Vision and Goals of Grade 1–8 Science and Technology

A long-range plan outlines and organizes curriculum expectations. It is a living document that is revised as educators become increasingly aware of the abilities, strengths, needs, and interests of students.

A thoughtfully developed long-range plan:

- ensures that instruction is sequenced in a manner that aligns with research about learning science and technology;
- allocates the appropriate time for concepts and skills so that students have multiple opportunities to focus on the overall expectations within the grades;
- connects concepts and skills to other strands within the curriculum, to other subject areas, and to the lives of students;
- ensures that all specific expectations are addressed at least once within the school year; and
- recognizes that some expectations need to be revisited several times throughout the year.

Note:

- These sample long-range plans outline possible sequences of instruction for the school year. There are many ways to structure an effective plan for learning.
- These sample plans include clusters of learning that have areas of focus from science and technology, as well as examples of cross-curricular connections that can be made to some expectations in other subject areas.

Reflective questions for consideration

Consider the following questions when developing, implementing, and reflecting on long-range plans. How can my plans:

- incorporate student voice, choice, and lived experiences to support engagement and understanding?
- honour and value varied realities of students and communities through using diverse resources, examples, and pedagogical approaches?
- incorporate tasks that are respectful and reflective of high expectations for all students?
- support the multiple ways assessment information should be collected (e.g., conversations, observations, and products)?
- support students in making connections between the curriculum expectations and real-life experiences including developments, research, and innovation in STEM fields?
- support students in exploring pathways and connections associated with various STEM-related careers?
- provide hands-on learning experiences enabling students to deepen their understanding of the science and technology they are learning and improve their STEM skills?
- support academic success by providing students with a range of opportunities to demonstrate their understanding of science and technology concepts and apply STEM skills as evidence of learning?

Grade 1 – Science and Technology – Long-Range Plan

Topics, expectations, and related curriculum

How do living things get what they need to survive?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.5, A3.1, A3.2, A3.3
- **Life Systems:** B1.1, B1.2, B2.1, B2.2, B2.3, B2.4, B2.5, B2.6

Other strands:

- **Matter and Energy:** C2.3
- **Structures and Mechanisms:** D2.5, D2.6
- **Earth and Space Systems:** E2.4, E2.5, E2.6

Examples of cross-curricular connections:

- **Health and Physical Education:** Healthy Living
- **Language:** Oral Communication, Writing
- **Mathematics:** Spatial Sense

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about the basic needs of living things, the ways in which living things provide for the needs of other living things, and the changes or problems that could result from the loss of living and non-living things. They consider the contributions that a wide variety of communities and people have made to helping living things meet their basic needs.	A3.3, B1.1, B2.2, B2.6
Students apply a scientific research process to investigate the characteristics of plants and animals and the location and function of various parts of the human body. They suggest questions related to these topics, consider where they might find the answers to these questions, and explore the answers as a class.	A1.1, B2.3, B2.4
Students connect learning from other strands of the curriculum as they consider food, everyday objects including structures, and specific materials as providing some of the basic needs required for living things. Students learn about concepts related to healthy eating in the Healthy Living strand of Health and Physical Education and this provides opportunities for students to explain why people need food to have healthy bodies and minds.	A3.1, A3.2, B2.2, B2.6, C2.3, D2.5, D2.6 **Health and Physical Education:** Healthy Living
Students consider the characteristics of a healthy environment, how a natural environment is a place where living and non-living things are interconnected, and how basic needs are provided for in environments. They consider how natural environments, and the living things within those environments, change from season to season and they describe how humans meet their basic needs in the different seasons. Students connect this learning to Spatial Sense in Mathematics as they read the date on a calendar, and use a calendar to identify days, weeks, months, holidays, and seasons.	B2.1, B2.2, B2.5, E2.4, E2.5, E2.6 **Mathematics:** Spatial Sense
Students connect and consolidate their learning related to natural environments and basic needs by identifying actions that can be taken to contribute to a healthy environment that can help meet the needs of living things, including humans. They communicate the purpose of these actions by using various text forms and specific science and technology vocabulary that are appropriate for specific audiences.	A1.5, B1.2, B2.1, B2.2, B2.5, B2.6 **Language:** Oral Communication, Writing

What is energy and where is it in our lives?

Focus strands:

- **STEM Skills and Connections:** A1.5, A2.1, A2.2, A3.1, A3.2
- **Matter and Energy:** C1.1, C1.2, C2.1, C2.2, C2.3, C2.4, C2.5, C2.6

Other strands:

- **Life Systems:** B2.2
- **Earth and Space Systems:** E2.6

Examples of cross-curricular connections:

- **Health and Physical Education:** Healthy Living
- **Mathematics:** Algebra

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about fundamental concepts related to how energy has the ability to move or change something, and how humans get the energy they need from the world around them, including from food and the Sun. They describe how healthy food can provide humans with the energy needed to move, and connect this learning to Health and Physical Education.	A1.5, A3.2, C2.1, C2.2, C2.3, C2.5 **Health and Physical Education:** Healthy Living
Students connect the concept of energy to their own lives as they consider various sources of energy and how these are used in their homes and in their schools and communities. They identify and explore technologies that use energy, and they explain how some technologies, and types of energy, are used at different times throughout the year to help humans respond to seasonal changes and meet their basic needs.	A2.2, A3.1, B2.2, C1.1, C2.4, C2.6, E2.6
Students apply coding skills, including those developed in the Algebra strand in Mathematics, as they design simple algorithms for small programs and as they adapt code so that it has the same outcome, but with fewer steps. They describe the various components of the computing system that require energy such as the keyboard, the mouse, or the robotics and physical computing devices being used.	A2.1, A2.2, A3.2, C1.1, C2.1, C2.4 **Mathematics:** Algebra
Students connect and consolidate their learning related to energy in their lives by learning about, and describing, how the lives of people and other living things would be affected if electrical energy were no longer available. They consider how this would impact humans differently in various seasons, and they consider technologies that use electrical energy to help meet a variety of needs during various seasons.	A1.5, B2.2, C1.1, C1.2, E2.6

What are some of the materials, objects, and structures around us?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.2, A1.3, A1.4, A1.5, A2.1, A3.2
- **Matter and Energy:** D1.1, D1.2, D2.1, D2.2, D2.3, D2.4, D2.5, D2.6, D2.7, D2.8

Other strand:

- **Life Systems**: B2.6

Examples of cross-curricular connections:

- **Language:** Oral Communication, Writing
- **Mathematics:** Algebra

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about fundamental concepts related to how objects are made up of materials, including some from nature, and how some objects can be organized to create various structures. They describe characteristics and purposes of objects in their homes and classrooms, and they identify structures and the loads that they support.	D2.1, D2.2, D2.3, D2.5, D2.8
Students apply an experimentation process as they investigate the properties of materials used to make everyday objects, the different kinds of fasteners, and the observable characteristics of various everyday objects.	A1.2, A1.4, D2.4, D2.6, D2.7
Students apply an engineering design process as they design and build a structure made from various objects and materials that supports a load. They describe the materials and objects in their structure, including any natural materials, and they develop a simple algorithm that involves sequential steps to help a classmate build a similar structure.	A1.3, A1.4, A1.5, A2.1, A3.2, B2.6, D2.2, D2.3, D2.6 **Language:** Oral Communication, Writing **Mathematics:** Algebra
Students identify the kinds of waste materials produced by humans and use components of a research process to help them plan and carry out a course of action that helps reduce the impact of disposing of materials and objects that are worn out or no longer needed in their school or home.	A1.1, D1.1, D1.2

What are daily and seasonal changes and how is the Sun involved?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.2, A1.4, A1.5, A2.1, A3.1, A3.2, A3.3
- **Earth and Space Systems:** E1.1, E1.2, E2.1, E2.2, E2.3, E2.4, E2.5, E2.6

Other strand:

- **Life Systems:** B2.2

Examples of cross-curricular connections:

- **Health and Physical Education:** Active Living, Healthy Living
- **Mathematics:** Algebra
- **Social Studies**: People and Environments: The Local Community

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about fundamental concepts related to Earth's relationship to the Sun, and how this relationship influences the daily and seasonal cycles and changes that are experienced, with a focus on changes in light and heat.	E2.1, E2.2, E2.3
Students engage in components of the research process to describe and compare the four seasons and the changes in appearance and behaviour of living things, during the various seasons. They analyse the contributions from various communities related to our knowledge of seasonal changes, including knowledge related to the sky and how this helped determine the best times for planting and harvesting crops.	A1.1, A1.5, A3.3, E2.4, E2.5, E2.6
Students apply coding skills to demonstrate their understanding of the Earth's relationship to the Sun, or the changes brought on by the various seasons, with an appreciation of the sequential steps involved in designing algorithms to communicate ideas.	A1.5, A2.1, E1.2, E2.1 **Mathematics:** Algebra

Skills and connections	Expectations and related curriculum
Students apply an experimentation process as they investigate the changes in light and heat from the Sun that occur in their classroom throughout the day and throughout the various seasons. They consider how these changes might impact a plant growing in the classroom, with respect to its basic needs.	A1.2, A1.4, B2.2, E1.2, E2.3
Students consolidate their learning by assessing the impact of daily and seasonal changes on human activities. They connect this learning to Social Studies as they consider how the interrelationship of people and the natural and built environments change during the different seasons, and how different services and occupations are needed during the various seasons. They also connect learning from Health and Physical Education, as they discuss various ways to be active, healthy, and safe during different seasons.	A1.5, A3.1, A3.2, E1.1, E1.2, E2.6 **Health and Physical Education:** Active Living, Healthy Living **Social Studies**: People and Environments: The Local Community

Connections and consolidation

Science and Technology:

- Strand A: STEM Skills and Connections
- Strand B: Life Systems
- Strand C: Matter and Energy
- Strand D: Structures and Mechanisms
- Strand E: Earth and Space Systems

Examples of cross-curricular connections:

- **Health and Physical Education:** Active Living, Healthy Living
  Language: Oral Communication, Writing
- **Mathematics:** Algebra
- **Social Studies:** People and Environments: The Local Community

Students design and complete larger activities and projects that connect learning from a variety of Science and Technology strands and other subject areas in the grade to explore real-world problems and the practical applications of science and technology in their home and community. They further develop their own STEM skills as they take a greater role in applying scientific research, scientific experimentation, and engineering design processes to find answers and design solutions to problems that interest them and that affect their lives and communities.

Students apply the scientific research process to investigate unanswered questions they, or the class, may have. These questions can focus on the waste produced by electronics, connecting the Matter and Energy and Structures and Mechanisms strands, or can focus on other waste materials produced by humans. Students can use this knowledge to further develop or implement a plan of action.

They apply the experimentation process as they investigate concepts related to the light and heat from the sun, such as melting ice cubes in different locations in the classroom, or in different locations in the schoolyard at different times of the year.

Students apply an engineering design process to refine their construction of structures that can support loads, and they consider how they could build a structure to support a plant. They describe how the design of the structure ensures that the plant can obtain its basic needs such as being supported, being easy to water, and being in a position to receive light and heat.

As students learn about real-world problems and the practical applications of Science and Technology concepts in these projects, they connect and apply learning from Health and Physical Education, Language, Mathematics, and Social Studies and describe how these concepts are relevant in their homes and communities.

Grade 2 – Science and Technology – Long-Range Plan

Topics, expectations, and related curriculum

How do animals grow, change, and move?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.5, A2.1, A3.1, A3.2
- **Life Systems:** B1.1, B1.2, B2.1, B2.2, B2.3, B2.4, B2.5

Other strand:

- **Structures and Mechanisms:** D2.1, D2.5

Examples of cross-curricular connections:

- **The Arts:** Dance
- **Health and Physical Education:** Movement Competence
- **Language:** Oral Communication, Writing

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to explore and understand fundamental concepts related to the characteristics of various animals, their locomotion and life cycles, and the adaptations that allow animals to survive in natural environments.	B2.1, B2.2, B2.3, B2.4, B2.5
Students apply coding skills that involve decomposing a problem into smaller steps as they demonstrate their understanding of animal locomotion and life cycles by programming automated digital or physical representations.	A2.1, B2.2, B2.3, B2.4
Students apply a scientific research process to answer questions related to the impact that animals have on society and the environment, and the impact of human activities have on animals. They describe practices that can help minimize impacts in these areas.	A1.1, A1.5, B1.1, B1.2 **Language:** Oral Communication, Writing
Students connect their learning of animal locomotion to simple machines and movement and to The Arts and Health and Physical Education as they compare animal locomotion with their own, and as they consider the forces required to move an object in physical activities, such as moving a ball with or without equipment such as a racket.	A3.1, A3.2, B2.2, D2.1, D2.5 **The Arts:** Dance **Health and Physical Education:** Movement Competence

What are liquids and solids and where are they in our lives?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.2, A1.4, A1.5, A3.1, A3.2
- **Matter and Energy:** C1.1, C1.2, C2.1, C2.2, C2.3, C2.4, C2.5, C2.6, C2.7

Other strand:

- **Life Systems:** B1.2

Examples of cross-curricular connections:

- **The Arts:** Visual Arts
  Language: Oral Communication, Writing

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about fundamental concepts related to the properties and changes of states of liquids and solids, as well as how liquids and solids can be combined to make useful mixtures. They pay close attention to where liquids, solids, and mixtures appear and are used in the natural and built environments at home, school, and in their communities and they explain the meaning of international symbols that give us information on the safety of substances.	A3.1, C2.1, C2.2, C2.3, C2.4, C2.5, C2.7
Students apply a scientific experimentation process to classify objects and materials in terms of their buoyancy and ability to absorb or repel water. They find creative and appropriate ways to communicate their learning.	A1.2, A1.4, A1.5, C2.6 **Language:** Oral Communication, Writing
Students apply a scientific experimentation process to investigate and describe ways in which liquids and solids can be combined to make useful mixtures. They connect this learning in practical ways to The Arts as they mix colours and work with paint or glue.	A1.2, A1.4, A1.5, A3.1, A3.2, C2.5 **The Arts:** Visual Arts
Students apply a scientific research process to assess practices related to the use, storage, and disposal of liquids and solids in the home, including developing an awareness of international symbols that provide information on safety. They suggest ways to improve related practices and they connect this learning to life systems as they consider the impact of the use, storage, and disposal of liquids and solids on animals and the places they live.	A1.1, A1.4, A1.5, B1.2, C1.1, C1.2

What are simple machines and how do they improve our lives?

Focus strands:

- **STEM Skills and Connections:** A1.2, A1.3, A1.4, A1.5, A2.1, A2.2, A3.1, A3.2, A3.3
- **Matter and Energy:** D1.1, D1.2, D2.1, D2.2, D2.3, D2.4, D2.5

Other strand:

- **Life Systems:** B2.2

Examples of cross-curricular connections:

- **The Arts:** Dance
- **Health and Physical Education:** Movement Competence
- **Mathematics:** Number, Algebra, Data

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about fundamental concepts related to ways an object can be moved and its position changed, as well as the six basic types of simple machines. They connect their learning from life systems as they consider the locomotion of various animals, and their learning from Health and Physical Education and The Arts as they consider their own movement. They analyse the contributions of communities and cultures from Canada and around the world who first created and used simple machines for farming and transport.	A3.3, B2.2, D2.1, D2.2, D2.3 **The Arts:** Dance **Health and Physical Education:** Movement Competence
Students explore the connections between simple machines, movement, and their home and community as they assess the impact of simple machines on daily lives and the impact of technologies that use simple machines on the environment. They investigate emerging technologies that incorporate simple machines into their designs and they and they consider how these practical applications of technology concepts help solve real-world problems in our homes and communities.	A2.2, A3.1, D1.1, D1.2, D2.4

Skills and connections	Expectations and related curriculum
Students apply a scientific experimentation process to compare, qualitatively or quantitively, the force required to move an object with and without the use of various simple machines. Students connect concepts from Mathematics as they keep track of the results of their experiments.	A1.2, A1.4, A1.5, A3.2, D2.3, D2.5 **Mathematics:** Number, Data
Students apply an engineering design process to incorporate simple machines into a project that moves objects to complete a specific task. Student can apply coding skills to automate projects that might involve simple robotics or physical computing components.	A1.3, A1.4, A2.1, D2.1, D2.3, D2.4
Students apply coding skills as they decompose a problem into smaller steps when controlling the movement of a character on a screen. They describe how the programming code controls the movement in the various directions and they apply and connect coding concepts from Mathematics as concurrent events are controlled in their programs.	A1.5, A2.1, D2.1 **Mathematics:** Algebra

Why is water important and how can I help protect it?

Focus strands:

- **STEM Skills and connections:** A1.1, A1.5, A2.1, A2.2, A3.1, A3.2, A3.3
- **Earth and Space Systems:** E1.1, E1.2, E1.3, E2.1, E2.2, E2.3, E2.4, E2.5

Other strand:

- **Matter and Energy:** C1.1, C2.1, C2.2, C2.3, C2.4

Examples of cross-curricular connections:

- **Health and Physical Education:** Healthy Living
- **Mathematics:** Spatial Sense
- **Social Studies:** People and Environments: Global Communities

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about fundamental concepts related to properties of air and water, sources of water, the water cycle, and the three states of water in the environment. Students connect their learning about water to concepts from Matter and Energy as they consider the properties of liquid and solid water and changes of state, and how these occur in the natural environment. They analyse the contributions from various people and communities to the awareness of water as an important resource, such as Ojibwe water songs sung by Anishinaabe women water keepers.	A3.3, C1.1, C2.1, C2.2, C2.3, C2.4, E2.1, E2.2, E2.3, E2.4
Students demonstrate their understanding of the properties of air and water, the states of water, and the water cycle by creating an artifact that helps communicate these concepts to classmates. They can use coding to develop an animated story representing the concepts, or they can use classroom materials, drawings, and designs.	A1.5, A2.1, E2.1, E2.3, E2.4
Students apply a scientific research process as they assess the impact of human activities on air and water, taking various perspectives into consideration, and examine the availability of fresh water around the world. They connect this learning to Social Studies as they identify basic human needs (e.g., for food, water, clothing, transportation, shelter), and describe some ways in which people in communities around the world meet these needs, and to Mathematics as they create and interpret simple maps that include the bodies of water in their communities.	A1.1, A1.5, A3.2, E1.1, E1.3 **Mathematics:** Spatial Sense **Social Studies:** People and Environments: Global Communities

Skills and connections	Expectations and related curriculum
Students consider ways in which living things depend on air and water, and they investigate the practical applications of air and water concepts as they consider water use in their homes and communities. They explore examples of technologies that provide, use, and dispose of water in their own home and they create a plan to use water responsibly. They can also connect this learning to Health and Physical Education as they consider good oral health practices, and how these activities can be integrated into their plan.	A2.2, A3.1, A3.2, E1.2, E2.5 **Health and Physical Education:** Healthy Living

Connections and consolidation

Science and Technology:

- Strand A: STEM Skills and Connections
- Strand B: Life Systems
- Strand C: Matter and Energy
- Strand D: Structures and Mechanisms
- Strand E: Earth and Space Systems

Examples of cross-curricular connections:

- **The Arts:** Dance, Visual Arts
- **Health and Physical Education:** Movement Competence, Healthy Living
- **Language:** Oral Communication, Writing
- **Mathematics:** Spatial Sense
- **Social Studies:** People and Environments: Global Communities

Students design and complete larger activities and projects that connect learning from a variety of Science and Technology strands and other subject areas in the grade to explore real-world problems and the practical applications of science and technology in their home and community.

They further develop their own STEM skills as they take a greater role in applying scientific research, scientific experimentation, and engineering design processes to find answers and design solutions to problems that interest them and that affect their lives and communities.

Students apply the scientific research process to investigate unanswered questions they, or the class, may have. These questions can focus on the impact of human activities on air and water, and on animals and the places they live, as they connect learning about air and water with the growth and changes in animals.

They apply the scientific experimentation process as they extend or build upon previous experiments from the year. They investigate the properties and physical changes of liquids and solids and connect this to the real world and the natural environment as they integrate their learning about water cycles and natural bodies of water.

Students apply the engineering design process as they refine or begin new designs focused on leveraging the work of simple machines to achieve a goal related to movement. They can add additional coding components to their designs, or program small, simple robots to understand how large programs that control movement to accomplish a task can be broken down into smaller steps.

As students learn about real-world problems and the practical applications of Science and Technology concepts in these projects, they connect learning from The Arts, Health and Physical Education, Mathematics, and Social Studies and describe how these concepts are relevant in their homes and communities.

Grade 3 – Science and Technology – Long-Range Plan

Topics, expectations, and related curriculum

Why are plants and soils important for humans and the environment?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.2, A1.4, A1.5, A3.1, A3.3
- **Life Systems:** B1.1, B2.1, B2.2, B2.3, B2.4, B2.5, B2.6, B2.7, B2.8
- **Earth and Space Systems:** E1.1, E2.1, E2.2, E2.3

Other strands:

- **Matter and Energy:** C2.1
- **Structures and Mechanisms:** D2.1

Examples of cross-curricular connections:

- **Health and Physical Education:** Healthy Living
- **Language:** Oral Communication, Writing
- **Mathematics:** Data

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about the parts of plants, their basic needs and characteristics, and components and types of soils. They also analyse contributions to science and technology related to supporting diversity in plants, such as Wangari Maathai and her Green Belt Movement that fights deforestation.	A3.3, B2.1, B2.2, B2.3, E2.1, E2.2, E2.3
Students apply a scientific experimentation process to investigate the changes plants undergo in their life cycle and how they react to changes in their environment, including different amounts of light and water levels, and different types of soils. They integrate learning from Mathematics as they collect data through observations and experiments to answer questions of interest.	A1.2, A1.4, A1.5, B2.1, B2.2, B2.3, B2.4, B2.5, E2.3 **Mathematics:** Data
Students apply a scientific research process to examine several types of soils, how the origins of food affect its nutritional value, how different soils are suited to growing different types of food, and the interrelationship between types of soils and the type of food grown including plants grown by First Nations, Métis, and Inuit communities.	A1.1, A1.4, A1.5, B1.1, B2.7, E1.1, E2.2, E2.3
Students connect learning from different Science and Technology strands by investigating the interrelationship between the growth of plants and the composition of soils. They identify plants as a structure in the natural environment, and describe how a non-contact force such as gravity is important to plants.	A3.1, B2.2, C2.1, D2.1, E2.1
Students connect Science and Technology activities to Health and Physical Education, as they consider ways in which plants and animals, including humans, depend on each other, how food choices can play a role in their Healthy Living, and how different soils are suited to growing different types of food. They analyse contributions to science and technology from various communities and consider plants grown for food by First Nations, Métis, and Inuit communities, and describe ways in which people, including Indigenous peoples from various cultures around the world, use plants for food, shelter, medicine, and clothing.	A3.3, B1.1, B2.6, B2.7, B2.8, E2.3 **Health and Physical Education:** Healthy Living

What impact do human activities have on plants and soils?

Focus strands:

- **STEM Skills and Connections**: A1.1, A1.2, A1.4, A1.5, A2.2, A3.1, A3.2, A3.3
- **Life Systems:** B1.2, B1.3

Other strands:

- **Earth and Space Systems:** E1.2, E2.4, E2.5, E2.6
- **Structures and Mechanisms:** D1.2

Examples of cross-curricular connections:

- **Language:** Oral Communication, Writing
- **Social Studies:** People and Environments: Living and Working in Ontario
- **Mathematics:** Data

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about the processes and practices that can affect the health of soil, paying close attention to examples of important soil use in their homes and community.	A3.1, B1.2, B1.3, E2.4, E2.5, E.2.6
Students apply a scientific experimentation process to investigate the different types of soils in Ontario and the different substances that are added to, or absorbed by, soil and their effects on soil health. They integrate learning from Mathematics as they collect data through observations and experiments to answer questions of interest.	A1.2, B1.2, B1.3, E2.3, E2.4, E2.5, E2.6 **Mathematics:** Data
Students apply a scientific research process to investigate the impact of human activities and erosion on soil, and they describe ways to minimize the harmful effects of each as they can communicate their findings through verbal or written formats.	A1.1, A1.4, A1.5, A2.2, A3.1, B1.2, B1.3, E1.2 **Language:** Oral Communication, Writing
Students make connections to other strands by investigating the plants used for materials in building structures for shelter, and how forces are involved in the erosion of soil. They will also connect Science and Technology concepts to Social Studies as they learn about types of soils in Ontario and the connections between features of the natural environment of a region and the land use that is established in that region. They analyse contributions, related to plant and soil health, from various people and communities to global and local city greening projects, or to beach/shore line clean-up initiatives led by local First Nations and/or Métis.	A3.1, A3.2, A3.3, B1.2, B1.3, D1.2, E1.2, **Social Studies:** People and Environments: Living and Working in Ontario

How are structures important in our lives?

Focus strands:

- **STEM Skills and Connections:** A1.2, A1.3, A1.4, A1.5, A2.2, A3.1
- **Structures and Mechanisms:** D1.1, D1.2, D2.1, D2.2, D2.3, D2.4, D2.5, D2.6, D2.7

Other strand:

- **Matter and Energy:** C1.1, C2.2, C2.3

Examples of cross-curricular connections:

- **The Arts:** Visual Arts
- **Mathematics: Data, Spatial Sense**

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about structures in the natural and built environment, the things that affect the strength and the stability of a structure, the role of struts and ties, the relationship between form and function, and the effects on society, the economy, and the environment of strong and stable structures. They connect this learning to Mathematics as they consider how triangles, rectangular prisms, and other shapes are appropriate for strengthening structures.	D1.1, D2.1, D2.2, D2.4, D2.5, D2.7 **Mathematics:** Spatial Sense
Students apply a scientific research process to explore how emerging technologies related to construction are altering related occupations and are helping to solve problems associated with building structures for humans.	A1.1, A1.4, A1.5, A2.2, A3.1, D1.1, D1.2
Students apply a scientific experimentation process to investigate the factors that affect the strength and the stability of structures and how the strength and stability can be improved.	A1.2, A1.4, A1.5, D2.4, D2.5
Students apply an engineering design process to build their own strong and stable structures using appropriate materials and take into consideration the action of forces from natural phenomena that can influence the strength and the stability of their structure. They integrate learning from Mathematics as they consider the characteristics of two-dimensional shapes and three-dimensional objects to maximize a structure's strength and/or stability, and from The Arts as they consider appropriate materials, tools, and techniques to respond to design challenges.	A1.3, A1.4, A1.5, A3.1, C1.1, C2.2, C2.3, D2.1, D2.2, D2.3, D2.4, D2.5, D2.6, D2.7, **The Arts:** Visual Arts **Mathematics:** Data, Spatial Sense

How can forces affect the motion of objects?

Focus strands:

- **STEM Skills and Connections:** A1.2, A1.3, A1.4, A1.5, A2.1, A2.2, A3.1, A3.2
- **Matter and Energy:** C1.1, C1.2, C2.1, C2.2, C2.3, C2.4

Other strand:

- **Structures and Mechanisms**: D2.6, D2.7

Examples of cross-curricular connections:

- **The Arts:** Dance
- **Health and Physical Education:** Movement Competence
- **Language:** Oral Communication, Writing
- **Mathematics**: Algebra, Spatial Sense

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about types of contact and non-contact forces and ways that force can be exerted on an object and cause motion, paying close attention to the ways in which forces are used in their home and community.	A3.1, C2.1, C2.2, C2.3, C2.4
Students apply a scientific experimentation process to investigate different forces and ways a force can be exerted on an object. They can connect their findings to discuss the effects of forces on strong and stable structures, as well as how forces can help send and receive objects of different shapes and sizes in Health and Physical Education.	A1.2, A1.4, A3.1, A3.2, C2.2, D2.6, D2.7 **Health and Physical Education:** Movement Competence **Language:** Oral Communication, Writing

Skills and connections	Expectations and related curriculum
Students apply an engineering design process to design and build devices that can use different forces to create controlled movement. They use location and movement concepts connected to their learning in Mathematics, while following established health and safety procedures. Students also combine coding concepts from Science and Technology and Mathematics to test, debug, and refine a program with repeating components that controls digital or physical components as they start, stop, and change direction to accomplish a task.	A1.3, A1.4, A1.5, A2.1, A3.1, C2.3 C2.4 **Mathematics:** Spatial Sense, Algebra
Students apply a scientific research process to investigate the action and effects that forces can have on natural and built environments, and on humans. They also answer questions related to how emerging technologies could minimize the negative effects of these forces.	A1.1, A1.4, A1.5, A2.2, C1.1, C1.2
Students connect Science and Technology concepts to The Arts and Mathematics, as they create a dance using a variety of movements and as they can explore spatial reasoning and consider the movement of objects.	A3.1, A3.2, C2.2, C2.3 C2.4 **The Arts:** Dance **Mathematics:** Spatial Sense

Connections and consolidation

Science and Technology:

- Strand A: STEM Skills and Connections
- Strand B: Life Systems
- Strand C: Matter and Energy
- Strand D: Structures and Mechanisms
- Strand E: Earth and Space Systems

Examples of cross-curricular connections:

- **Health and Physical Education:** Movement Competence
  Language: Oral Communication, Writing
- **Mathematics:** Algebra, Data, Spatial Sense
- **Social Studies:** People and Environments: Living and Working in Ontario

Students design and complete larger activities and projects that connect learning from a variety of Science and Technology strands and other subject areas in the grade to real-world problems and the practical applications of science and technology.

They further develop their own STEM skills as they take a greater role in implementing scientific research, scientific experimentation, and engineering design processes to find answers and design solutions to problems that interest them and that affect their lives and communities.

Students apply scientific research processes to investigate unanswered questions they, or the class, may have. These questions can focus on connecting emerging technology, the needs of plants, soils, and structures as they explore vertical farming or alternative ways to grow crops for food, shelter, medicine, and farming. Questions can also focus on construction and how emerging technologies helped or are helping to build strong, stable, and safe buildings, tunnels, bridges, and other structures in the world or in their local communities.

They engage in further experimentation related to needs of plants, how they adapt and react to changes and the environment, and they apply coding skills to demonstrate and communicate their learning through animated demonstrations or stories.

Students apply an engineering design process to design and test methods to resist the action of forces such as erosion on natural and built environments.

As students learn about real-world problems and the practical applications of Science and Technology concepts in these projects, they analyse contributions to science and technology from various communities and connect learning from Health and Physical Education, Mathematics, and Social Studies, and explore practical applications of Science and Technology concepts in their home and community.

Grade 4 – Science and Technology – Long-Range Plan

Topics, expectations, and related curriculum

What makes up habitats and communities and how do they remain sustainable?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.5, A2.1, A3.2, A3.3
- **Life Systems:** B1.1, B1.2, B2.1, B2.2, B2.3, B2.4, B2.5, B2.7

Example of cross-curricular connections:

- **Social Studies:** People and Environments: Political and Physical Regions of Canada

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about fundamental concepts related to habitats, communities, food chains, food webs, and how animals are categorized according to their diets.	B2.1, B2.2, B2.3, B2.4, B2.5
Students apply a scientific research process to investigate why all habitats have limits to the number of plants and animals that can be supported, the positive and negative impacts of human activities on habitats and communities, and the impact of the depletion or extinction of a species. They connect this learning to Social Studies as they assess aspects of the environmental impact of different industries on habitats and communities, and on physical and political regions in Canada.	A1.1, A3.2, B1.1, B1.2, B2.7 **Social Studies:** People and Environments: Political and Physical Regions of Canada
Students demonstrate their understanding of food chains and food webs by creating an artifact that helps communicate these concepts to classmates. They apply coding skills to develop, alter, or use a computational model that explores and communicates the relationship between different animals and plants in a habitat or community. They analyse contributions to science and technology from a variety of groups and organizations, including local and global initiatives that promote sustainable practices and development.	A1.5, A2.1, A3.3, B2.3, B2.4, B2.5

How do light and sound work?

Focus strands:

- **STEM Skills and Connections:** A1.2, A1.4, A1.5, A2.1, A2.2, A3.1, A3.2
- **Matter and Energy:** C1.1, C1.2, C2.1, C2.2, C2.3, C2.4, C2.5, C2.6, C2.7, C2.8

Examples of cross-curricular connections:

- **The Arts:** Drama, Music, Visual Arts
- **Language:** Oral Communication, Writing
- **Mathematics:** Algebra, Spatial Sense

Skills and connections	Expectations and related curriculum
Students identify light and sound technology in their homes, schools, and communities and investigate the impacts of light and sound energy on society and the environment, considering the positive and negative aspects. They also consider how light- and sound-related technologies are used in occupations, including the skilled trades, to solve real-world problems. They connect this learning to Social Studies as they assess aspects of the environmental impact of different industries on habitats and communities.	A2.2, A3.1, A3.2, C1.1, C1.2

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about fundamental concepts related to the properties of light, natural and artificial light sources, sources of light and heat, and the differences between objects that emit light and those that reflect light from other sources. The connect their learning to Mathematics as they consider reflections and lines of symmetry using miras.	C2.1, C2.2, C2.4, C2.7 **Mathematics:** Spatial Sense
Students complete a range of introductory activities to learn about fundamental concepts related to the properties of sound, how vibrations cause sounds waves, and sensory organs that make use of the properties of light and sound.	C2.4, C2.5, C2.8
Students apply a scientific experimentation process to investigate how light can be absorbed, reflected, and refracted. They describe how different objects and materials interact with light using subject-specific vocabulary and oral and written text forms. Students apply a scientific experimentation process to investigate how sound can be absorbed, reflected, or modified and how different objects and materials interact with sound.	A1.2, A1.4, A1.5, C2.3, C2.4, C2.6 **Language:** Oral Communication, Writing
Students apply coding skills as they control light and sound output from a program to create various computational artifacts, including artistic patterns with lines, shapes, lights, and music that are developed on screen or with physical computing components. They make connection to The Arts as they communicate using audio, visual, and technological aids.	A1.4, A2.1, A3.2, C2.1, C2.6, C2.7 **The Arts:** Drama, Music, Visual Arts **Mathematics:** Algebra

What are the components of machines and how are machines changing our world?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.3, A1.4, A1.5, A2.1, A2.2 A3.1, A3.2
- **Structures and Mechanisms**: D1.1, D1.2, D2.1, D2.2, D2.3, D2.4, D2.5

Example of cross-curricular connections:

- **Mathematics:** Algebra

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about fundamental concepts related to the parts of various mechanisms, how different mechanisms transmit and transform motion, and how forces are changed in a variety of machines.	D2.2, D2.3, D2.4, D2.5
Students identify machines that are used in their homes and communities, as well as in the skilled trades and other occupations. Various parts, and the purposes of those parts, are explored including the parts and components of emerging technologies that will play an important role in the future.	A2.2, A3.1, D2.1, D2.2
Students apply an engineering design process to design and build a machine that transmits and transforms motion to accomplish a task. They can apply coding skills to automate the system and can control motors and other output devices as they integrate coding concepts and skills, such as reading code and using control structures, from Mathematics.	A1.3, A1.4, A2.1, A3.2, D2.3, D2.4, D2.5 **Mathematics:** Algebra
Students apply a scientific research process to assess the impact of machines and their mechanisms on the daily lives of people and compare the environmental impacts of different machines designed for the same purposes. They look closely at various occupations impacted by machines, including the skilled trades, and how people and machines solve real-world problems within these occupations. They also analyse contributions to science and technology, such as those from Elijah McCoy, related to engineering and machine efficiency.	A1.1, A1.5, A3.1, A3.2, A3.3, D1.1, D1.2, D2.1

How are rocks and minerals formed and how are they used by humans?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.2, A1.4, A1.5, A3.1
- **Earth and Space Systems:** E1.1, E1.2, E2.1, E2.2, E2.3, E2.4, E2.5, E2.6

Other strand:

- **Life Systems:** B1.2, B2.6

Examples of cross-curricular connections:

- **Language:** Oral Communication, Writing
- **Mathematics:** Data
- **Social Studies:** People and Environments: Political and Physical Regions of Canada

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about fundamental concepts related to geological processes, as well as the properties, composition, and uses of rocks. They explore how fossils are formed and how fossils can provide information related to Earth's history.	A3.1, E2.1, E2.2, E2.3, E2.5
Students apply a scientific experimentation process to classify rocks and minerals according to their composition and physical properties, using appropriate data collection and organization techniques from Mathematics. They communicate their findings using subject-specific vocabulary and oral and written text forms that are appropriate for specific audiences and purposes.	A1.2, A1.4, A1.5, E2.2, E2.3 **Language:** Oral Communication, Writing **Mathematics:** Data
Students apply a scientific research process to learn about the ways in which geological processes impact society and the environment, including how these processes impact the habitats and communities of plants and animals.	A1.1, A1.5, B1.2, B2.6, E1.1, E2.1
Students apply a scientific research process to explore the issues surrounding the use of rocks and minerals by humans. They demonstrate an understanding of First Nations, Métis, and Inuit geological knowledges that are used in the selection of different rocks and minerals for specific purposes, and they consider everyday uses of rocks and minerals in their homes, schools, and communities. They also assess the social and environmental impacts of extracting and refining rocks and minerals, and connect this to their learning in Social Studies as they consider the impact of different industries in physical or political regions of Canada.	A1.1, A1.5, A3.1, E1.1 E1.2, E2.4, E2.6 **Social Studies:** People and Environments: Political and Physical Regions of Canada

Connections and consolidation

Science and Technology:

- Strand A: STEM Skills and Connections
- Strand B: Life Systems
- Strand C: Matter and Energy
- Strand D: Structures and Mechanisms
- Strand E: Earth and Space Systems

Examples of cross-curricular connections:

- **Language:** Oral Communication, Writing
- **Mathematics:** Algebra, Data
- **Social Studies:** People and Environments: Political and Physical Regions of Canada

Students design and complete larger activities and projects that connect learning from a variety of Science and Technology strands and other subject areas in the grade to explore real-world problems and the practical applications of science and technology in their home and community.

They further develop their own STEM skills as they take a greater role in applying scientific research, scientific experimentation, and engineering design processes to find answers and design solutions to problems that interest them and that affect their lives and communities.

Students apply a scientific research process to identify sensory organs that make use of the properties of light and sound, and they connect this learning to life systems as they describe structural adaptions, related to light and sound, of plants and animals that allow them to survive in specific habitats. They further explore the properties of light and sound by coding artifacts that use light and sound as output, or that replicate a simplified model of a related organ system or adaptation of a plant or animal.

They apply a scientific experimentation process as they extend or build upon previous experiments. They use light or machines and mechanisms, such as a rock tumbler, to investigate the composition and physical properties of rocks and minerals.

Students investigate machines used for extracting and refining rocks and minerals, and they apply an engineering design process to design and build a simplified, working version of a similar machine, potentially using coding to control motors or other components of the system as output.

As students learn about real-world problems and the practical applications of Science and Technology concepts in these projects, they connect learning from Social Studies to investigate the impact of humans on natural habitats in terms of the use of machines, the use of technologies that produce light and sound, and the extraction and refining of rocks and minerals.

Grade 5 – Science and Technology – Long-Range Plan

Topics, expectations, and related curriculum

What are the systems in my body and how can these systems remain healthy?

Focus strands:

- **STEM Skills and Connections:** A1.1, A2.1, A2.2, A3.1, A3.2
- **Life Systems:** B1.1, B1.2, B2.1, B2.2, B2.3, B2.4

Other strand:

- **Structures and Mechanisms:** D2.5

Examples of cross-curricular connections:

- **Health and Physical Education:** Active Living, Healthy Living
- **Language:** Oral Communication, Writing
- **Mathematics:** Algebra

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to explore and understand the systems of the body and their interrelationships, vital organs, and various disease and disorders that affect body systems and specific organs. They connect this learning to Active Living and Healthy Living components in Health and Physical Education.	A3.2, B2.1, B2.2, B2.3, B2.4 **Health and Physical Education:** Active Living, Healthy Living
Students apply a scientific research process to investigate the effects of social and environmental factors on human health and specific body systems and organs. They include considerations related to how food literacy can support decisions that affect both physical and mental health and they connect their learning to Active Living and Healthy Living concepts in Health and Physical Education.	A1.1, B1.1, B1.3, B2.1, B2.2, B2.4 **Health and Physical Education:** Active Living, Healthy Living
Students apply coding skills to obtain data, and/or store and process data, related to the body system and organs. This can include a program that keeps track of heart rate or temperature data. They apply and connect coding concepts from Mathematics, such as the use of conditional statements and other control structures, to complete the program, paying close attention to how this health data can be stored and processed.	A2.1, A2.2, B2.1, B2.2 **Mathematics:** Algebra
Students apply a scientific research process to evaluate the beneficial and harmful effects of various technologies on human health, including the type of digital system they programmed themselves to store and process health data. They consider emerging technologies in the health and wellness fields, including skilled trades related to the health care sector, and they communicate their findings using vocabulary and formats that are appropriate for specific audiences and purposes.	A1.1, A2.2, A3.1, A3.2, B1.2, D2.5 **Language:** Oral Communication, Writing

What is matter and how is it changed?

Focus strands:

- **STEM Skills and Connections:** A1.2, A1.4, A1.5, A2.2, A3.1, A3.2
- **Matter and Energy:** C1.1, C1.2, C2.1, C2.2, C2.3, C2.4, C2.5, C2.6, C2.7

Examples of cross-curricular connections:

- **The Arts:** Visual Arts
- **Language:** Oral Communication, Writing

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about the properties of matter, changes of state, and chemical and physical change.	C2.1, C2.2, C2.3, C2.4, C2.5, C2.6
Students apply a scientific experimentation process to investigate and describe characteristics and properties of solids, liquids, and gases. They connect their findings to the real world as the explain why specific physical properties of solids, liquids, and gases make them useful for particular applications, and they can consider The Arts concepts as they consider the properties of solids and liquids used in paintings and sculptures in two- and three-dimensional art works.	A1.2, A1.4, A1.5, A3.1, A3.2, C2.2, C2.7 **The Arts:** Visual Arts **Language:** Oral Communication, Writing
Students apply a scientific experimentation process to investigate physical and chemical changes of states of matter and how changes of state can occur when matter absorbs or releases thermal energy. They describe the chemical changes as well as similar changes of state of matter that are observed at home, in the community, and in natural environments using subject-specific vocabulary and oral and written text forms.	A1.2, A1.4, A3.1, A3.2, C2.4, C2.3, C2.5, C2.6 **Language:** Oral Communication, Writing
Students explore emerging technologies that make use of the properties of solids, liquids, and gases for practical applications in specific fields, including the skilled trades. They assess the impacts on society and the environment, including related health problems or medical disorders, of various processes used in the manufacture of common products, as well as how the use of specific materials in the manufacture of common products affects the environment.	A2.2, A3.1, A3.2, B2.4, C1.1, C1.2, C2.7

What are the types of forces and how do they affect structures as well as humans and other organisms?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.3, A1.4, A1.5, A2.2, A3.1, A3.2, A3.3
- **Structures and Mechanisms**: D1.1, D1.2, D2.1, D2.2, D2.3, D2.4, D2.5

Examples of cross-curricular connections:

- **The Arts:** Visual Arts
- **Health and Physical Education:** Active Living, Healthy Living
- **Language:** Oral Communication, Writing

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about internal and external forces acting on structures, as well as forces from natural phenomena.	D2.1, D2.2, D2.3
Students apply an engineering design process to design and build a structure that can withstand a variety of forces and accomplish a specific task. Students identify the internal, external, and natural forces acting on the structure and do so using subject-specific vocabulary and oral and written text forms that are appropriate for specific audiences and purposes. They can connect this learning to three-dimensional artwork developed in The Arts.	A1.3, A1.4, A1.5, D2.1, D2.2, D2.3 **The Arts:** Visual Arts **Language:** Oral Communication, Writing
Students apply a scientific research process to analyse the effects of forces from natural phenomenon on structures in natural and built environments, while looking closely at how the physical characteristics of various animals and plant species help protect them from the harmful effects of forces.	A1.1, D1.1, D2.4

Skills and connections	Expectations and related curriculum
Students explore emerging technologies and protective equipment that help to protect humans from the harmful effects of forces, including equipment used in specific careers and fields, such as the skilled trades, and connect their learning to concepts from Active Living and Healthy Living in Health and Physical Education. They also explore contributions of engineers from various communities around the world to technological innovations, such as individuals celebrated during International Women in Engineering Day and Engineering Week.	A2.2, A3.1, A3.2, A3.3, B2.1, B.2.2, D1.2, D2.5 **Health and Physical Education:** Active Living, Healthy Living

Why is energy important and how is it generated, transformed, and used?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.2, A1.3, A1.4, A1.5, A2.1, A2.2, A3.1, A3.3
- **Earth and Space Systems:** E1.1, E1.2, E1.3, E2.1, E2.2, E2.3, E2.4, E2.5, E2.6

Examples of cross-curricular connections:

- **Mathematics:** Algebra
- **Social Studies:** People and Environments: The Role of Government and Responsible Citizens

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about the different forms of energy and how each is used in everyday life, as well as the conservation of energy and how energy is stored as potential energy and transformed in various devices or systems.	A2.2, E2.1, E2.2, E2.3, E2.4
Students apply a scientific experimentation process to investigate the conservation of energy, including how energy cannot be created or destroyed, but can only be transformed from one form to another.	A1.2, A1.4, E2.2
Students apply an engineering design process and coding skills, including those related to conditional statements and other control structures in Mathematics, to design and build an automated system that transforms electrical energy into light, mechanical, and/or sound energy. They describe how energy is transformed in the automated system and how some energy may dissipate into the environment.	A1.3, A1.4, A1.5, A2.1, E2.3, E2.4 **Mathematics:** Algebra
Students apply a scientific research process to investigate contributions to energy and resource conservation from various communities, including Inuit practices for flash freezing fish and food-preservation techniques that have resulted in better-quality frozen foods for human consumption and health.	A1.1, A1.5, A3.1, A3.3, E1.3
Students apply a scientific research process to investigate renewable and non-renewable sources of energy and explain how the use of energy derived from fossil fuels changes the composition of the atmosphere. They also analyse the long-term impacts of human uses of energy and natural resources on society and the environment, including climate change, and they describe ways in which individuals can use technology to reduce energy consumption. They connect these Science and Technology concepts to their learning in People and Environments: The Role of Government and Responsible Citizens in Social Studies as they explain why different groups may have different perspectives on specific environmental issues.	A1.1, A1.5, A3.1, E1.1, E1.2, E2.5, E2.6 **Social Studies:** People and environments: The role of government and responsible citizens

Connections and consolidation

Science and Technology:

- Strand A: STEM Skills and Connections
- Strand B: Life Systems
- Strand C: Matter and Energy
- Strand D: Structures and Mechanisms
- Strand E: Earth and Space Systems

Cross curricular connections:

- **The Arts:** Visual Arts
- **Health and Physical Education:** Active Living, Healthy Living
- **Language:** Oral Communication, Writing
- **Mathematics:** Algebra
- **Social Studies:** People and Environments: The Role of Government and Responsible Citizens

Students design and complete larger activities and projects that connect learning from a variety of Science and Technology strands and other subject areas in the grade to explore real-world problems and the practical applications of science and technology in their home and community.

They further develop their own STEM skills as they take a greater role in exploring components of scientific research, scientific experimentation, and engineering design processes to find answers and design solutions to problems that interest them and that affect their lives and communities.

Students apply a scientific research process to investigate unanswered questions they, or the class, may have. These questions can focus on the impacts on society and the environment of various processes used in the manufacture of common products, and how specific materials use in the manufacturing of common products affect the environment.

They apply a scientific experimentation process as they extend or build upon their previous experiments. They further investigate properties of matter and changes of state, as well as energy and how it is transformed.

Students apply an engineering design process and coding skills to design and build an automated system that models a real-world machine that transforms electrical energy to mechanical, sound, or light energy.

As students learn about real-world problems and the practical applications of Science and Technology concepts in these projects, they connect learning from Health and Physical Education and Social Studies as they consider the health of their own body systems and organs, and the health of planet Earth. They assess the effects of a variety of social and environmental factors on human health and climate change, including the processes that are used to manufacture common products, the specific materials used in manufacturing, and the human uses of energy and natural resources. They identify actions that society and individuals can take to mitigate negative impacts related to human health and climate change.

Grade 6 – Science and Technology – Long-Range Plan

Topics, expectations, and related curriculum

Why is biodiversity important and how does it help natural systems stay balanced?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.5, A3.2, A3.3
- **Life Systems:** B1.1, B1.2, B2.1, B2.2, B2.3, B2.4, B2.5, B2.6, B2.7, B2.8

Other strands:

- **Matter and Energy:** C1.2
- **Structures and Mechanisms:** D2.3, D2.4, D2.5
- **Earth and Space Systems:** E1.2, E1.3

Examples of cross-curricular connections:

- **Health and Physical Education:** Healthy Living
- **Language:** Oral Communication, Writing
- **Social Studies:** People and Environments: Canada's Interactions with the Global Community

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about fundamental concepts related to the diversity of life on Earth, the interrelationships within and between species, and the biodiversity of communities and habitats.	B2.1, B2.2, B2.3, B2.4, B2.5, B2.6, B2.7, B2.8
Students look closely at the characteristics and classification of different groups of organisms and connect this learning to flight by looking at characteristics and adaptations that enable organisms to fly.	B2.1, D2.3, D2.4, D2.5
Students apply a scientific research process to investigate why biodiversity is important to maintain stability in natural systems and to investigate the impacts of an invasive species of animal or plant on a local, natural system as they plan and communicate a course of action to respond to the issues. They explore the importance of biodiversity in supporting agriculture, and they connect this learning to Health and Physical Education as they consider how biodiversity and natural systems can impact healthy food choice and availability.	A1.1, A1.5, B1.1, B1.2, B2.2, B2.3, B2.4, B2.5, B2.6, B2.7, B2.8 **Health and Physical Education:** Healthy Living **Language:** Oral Communication, Writing
Students connect Science and Technology activities to Social Studies, as they explore why some issues related to biodiversity are of international importance and require participation of other regions of the world, along with Canada, if they are to be addressed. They also explore the contributions of Indigenous peoples to biodiversity, by applying the guiding principle of two-eyed seeing (*Etuaptmumk*) as a way of integrating Indigenous knowledges and ways of knowing with Western knowledges and ways of knowing, bringing multiple perspectives and insights to the discipline of Science and Technology.	A3.2, A3.3, B1.1, B2.2, B2.4, B2.7 **Social Studies:** People and Environments: Canada's Interactions with the Global Community
Throughout these activities, students connect learning from different Science and Technology strands by considering the impacts of renewable and non-renewable sources of energy, and space exploration and technologies on biodiversity and natural systems in relation to climate change and losses of biodiversity.	B2.7, C1.2, E1.2, E1.3

How is energy transformed and used and what is its role in our lives today and tomorrow?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.2, A1.3, A1.4, A1.5, A2.1, A2.2, A3.1, A3.2, A3.3
- **Matter and Energy:** C1.1, C1.2, C2.1, C2.2, C2.3, C2.4, C2.5, C2.6, C2.7

Other strand:

- **Life Systems:** B1.1, B1.2

Examples of cross-curricular connections:

- **The Arts:** Music, Visual Arts
- **Mathematics:** Number, Algebra, Data
- **Social Studies:** People and Environments: Canada's Interactions with the Global Community

Skills and connections	Expectations and related curriculum
Students complete a wide range of introductory activities to learn about fundamental concepts related to the principles of electricity including static and dynamic electricity, conductors and insulators, and parallel and series circuits.	C2.1, C2.2, C2.3, C2.6, C2.7
Students apply a scientific experimentation process to conduct investigations that compare and demonstrate the differences between static and dynamic electricity, conductors and insulators, and parallel and series circuits. Students can make connections to their learning in Mathematics as they record, organize, and present data related to their experiments.	A1.2, A1.4, A1.5, C2.1, C2.2, C2.3, C2.6, C2.7 **Mathematics:** Number, Data
Students apply an engineering design process and coding skills to design and program simple circuits that use electrical components to obtain input, and that transform various forms of energy into electrical energy. They combine coding concepts and skills from Science and Technology and from Mathematics to develop and adapt their code to suit changing circumstances or different purposes, such as obtaining light levels or temperature data in different settings.	A1.3, A2.1, A2.2, C2.3, C2.4, C2.5, C2.6 **Mathematics:** Algebra
Students investigate how electricity is transformed into other forms of energy and connect learning to The Arts as they consider the role of electrical devices in musical composition and performance in the visual arts. Students also explore how emerging technologies related to electricity are transforming sectors such as agriculture, automotive, manufacturing, and green industries.	A2.2, A3.1, A3.2, C2.4, C2.5 **The Arts:** Music, Visual Arts
Students make connections to other strands in the Science and Technology curriculum as they use a scientific research process to assess the impact of the use and generation of electricity on biodiversity, First Nations, Métis, and Inuit communities, and climate change. They also connect learning to other subject areas, including Social Studies, as they explore how the use and generation of electrical energy impact Canada's interactions with the global community.	A1.1, A1.5, A3.2, A3.3 B1.1, B1.2, C1.1, C1.2 **Social Studies:** People and Environments: Canada's Interactions with the Global Community

What are the impacts of aviation technologies on our lives and how do the properties of air relate to flight?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.3, A1.4, A1.5, A2.1, A2.2, A3.2, A3.3
- **Structures and Mechanisms:** D1.1, D2.1, D2.2, D2.3, D2.4, D2.5

Other strands:

- **Life Systems:** B1.2, B2.1
- **Earth and Space Systems:** E1.1, E1.2, E2.2, E2.3, E2.6

Examples of cross-curricular connections:

- **Language:** Oral Communication, Writing
- **Mathematics:** Number, Algebra, Data, Spatial Sense
- **Social Studies:** People and Environments: Canada's Interactions with the Global Community

Skills and connections	Expectations and related curriculum
Students complete a wide range of introductory activities to learn about fundamental concepts related to the properties of air, the forces of flight, gravity and weight, and how flying machines control flight. They explore the contributions from Black aviators (e.g., Cornelius Coffey, Bessie Coleman) whose flight explorations contributed to the understanding of forces (e.g., gravity, friction) acting against structures and ways to create stronger and more stable aircraft.	A2.1, A3.3, D2.1, D2.2, D2.3, D2.4, E2.2, E2.3
Students connect what they know about air and flight to biodiversity and space, as they consider characteristics and adaptations of different organisms that allow them to control flight and how flight, and the forces of flight, differ as a result of the conditions in space.	A2.2, B2.1, D2.1, D2.2, D2.3, D2.4, D2.5, E1.1, E2.2, E2.6
Students apply coding skills and Mathematics concepts to alter or develop their own introductory computational models that simulate and demonstrate the four forces of flight or the associated properties of air. They also investigate emerging technologies related to the properties of air, flight, and associated space travel including flight simulators and digital wind tunnels.	A2.1, A2.2, D1.1, E2.6 **Mathematics:** Number, Algebra, Data, Spatial Sense
Students apply an engineering design process to investigate, apply, and demonstrate their understanding of lift, thrust, drag, gravity and weight as they design and build flying machines. They communicate their findings, using science and technology vocabulary and choice of oral and written texts that are appropriate for specific audiences and purposes.	A1.3, A1.4, A1.5, D2.1, D2.2, D2.3, D2.4, E2.2, E2.3 **Language:** Oral Communication, Writing
Students connect learning from different Science and Technology strands as they apply a scientific research process to investigate the impacts of aviation technologies on society. They consider local and global perspectives, and they connect learning from other subject areas, such as in Social Studies, as they explore how flight allows individuals to quickly travel from country to country, and expands Canada's interactions with the global community.	A1.1, A3.2, A3.3, B1.2, D1.1, E1.2 **Social Studies:** People and Environments: Canada's Interactions with the Global Community

How does our exploration of space connect to our daily lives?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.2, A1.3, A1.4, A1.5, A2.2, A3.2, A3.3
- **Earth and Space Systems:** E1.1, E1.2, E1.3, E2.1, E2.2, E2.3, E2.4, E2.5, E2.6

Other strand:

- **Matter and Energy:** C2.4, C2.5

Examples of cross-curricular connections:

- **Health and Physical Education:** Healthy Living
- **Mathematics:** Number, Algebra, Spatial Sense

Skills and connections	Expectations and related curriculum
Students complete a wide range of introductory activities to learn about fundamental concepts related to the solar system, bodies in space that emit and reflect light, and the motions of the Earth, Moon and Sun. They draw on their mathematical understanding of mass to differentiate it from weight and the way it is measured and use their algebraic reasoning to solve problems involving the relationship between the force of gravity and the weight of a body.	E1.1, E2.1, E2.3, E2.4, E2.5 **Mathematics:** Number, Algebra, Spatial Sense
Students apply a scientific experimentation or an engineering design process as they safely explore and demonstrate, or build models to represent, concepts related to mass and weight, gravity, and the position and motions of components in the solar system.	A1.2, A1.3, A1.4, A1.5, E1.1, E2.1, E2.2, E2.3, E2.5
Students investigate space exploration technologies, including emerging technology and automation, and assess how these technologies impact their understanding of space and connect to some of the power tools used in various occupations including the skilled trades, and to their every day lives.	A2.2, C2.4, C2.5, E1.2, E1.3, E2.6
Students apply a scientific research process to analyse contributions to space exploration from various communities and investigate the impact of space exploration on human health and wellness, considering what they know about mass, weight, gravity, and other conditions in space, as well as connecting their learning from the Healthy Living strand of Health and Physical Education.	A1.1, A3.2, A3.3, E1.1, E2.2, E2.3 **Health and Physical Education:** Healthy Living

Connections and consolidation

Science and Technology:

- Strand A: STEM Skills and Connections
- Strand B: Life Systems
- Strand C: Matter and Energy
- Strand D: Structures and Mechanisms
- Strand E: Earth and Space Systems

Examples of cross-curricular connections:

- **Health and Physical Education:** Healthy Living
- **Language:** Oral Communication, Writing
- **Mathematics:** Number, Algebra, Data, Spatial Sense
- **Social Studies:** People and Environments: Canada's Interactions with the Global Community

Students design and complete larger activities and projects that connect learning from a variety of Science and Technology strands and other subject areas in the grade to explore real-world problems and the practical applications of Science and Technology concepts in various occupations, including the skilled trades.

They further develop their own STEM skills as they take a greater role in implementing scientific research, scientific experimentation, and engineering design processes to find answers and design solutions to problems that interest them and that affect their lives and communities.

Students apply a scientific research or scientific experimentation process to investigate unanswered questions they, or the class, may have related to topics in the year. This includes topics related to how technologies and occupations in the area of flight, electrical energy, and space exploration are helping to solve problems associated with biodiversity and/or climate change on Earth.

Questions related to future habitats in space are explored as a context that provides opportunities for students to connect leaning in all strands as they consider technologies needed for organisms to thrive in space, for energy to be produced or used in space, and for efficiently transporting people and things to space.

Students apply an engineering design process to design, build, and test computational simulations, physical models, and/or simple robotic systems to connect and demonstrate concepts related to flying machines, electrical energy, and space exploration.

As students learn about real-world problems and the practical applications of Science and Technology concepts in these projects, they analyse contributions to science and technology from various communities. They also connect learning from Health and Physical Education, Mathematics, and Social Studies and explore careers, specifically related to the skilled trades, that use current and emerging technologies to solve practical problems in their everyday lives.

Grade 7 – Science and Technology – Long-Range Plan

Topics, expectations, and related curriculum

What makes up ecosystems and how can we help protect them?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.5, A2.2, A3.1, A3.3
- **Life Systems:** B1.1, B1.2, B1.3, B2.1, B2.2, B2.3, B2.4, B2.5, B2.6, B2.7, B2.8

Other strand:

- **Earth and Space Systems:** E1.2

Examples of cross curricular connections:

- **Language:** Oral Communication, Writing
- **Geography:** Physical Patterns in a Changing World

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about ecosystems, the interactions among living organisms and their environment, biotic and abiotic components, and how biotic and abiotic factors limit the number of organisms an ecosystem can have.	B2.1, B2.2, B2.7
Students apply a scientific research process to investigate producers, consumers, and decomposers, the transfer of energy in an ecosystem, and the cycling of matter. They communicate their findings using subject-specific vocabulary and oral and written text forms that are appropriate for specific audiences and purposes.	A1.1, A1.5, B2.3, B2.4, B2.5, B2.6 **Language:** Oral Communication, Writing
Students apply a scientific research process to assess how biotic and abiotic factors limit the number of organisms an ecosystem can sustain. They describe how different approaches to agriculture and to harvesting food from the natural environment can impact an ecosystem, and they analyse how diverse First Nations, Métis, and Inuit practices and perspectives contribute to environmental sustainability.	A1.1, A3.3, B1.3, B2.7, B2.8
Students explore various ways of mitigating the negative and enhancing the positive impact of human activities on the environment. They explore the impact of various technologies on the environment, including those helping to maintain or restore balance to ecosystems. They connect this learning to Geography as they consider learning related to challenges and opportunities presented by the physical environment and ways in which people have responded to them in Physical Patterns in a Changing World. They also analyse important contributions to science and technology, such as how the work of mathematician Dr. Gladys West contributed to the development of the Global Positioning System, which is now used in scientific research and experimentation to help us better understand interactions in the environment.	A2.2, A3.1, A3.3, B1.1, B1.2, B2.8, E1.2 **Geography:** Physical Patterns in a Changing World

What is the particle theory and how does it relate to substances and mixtures?

Focus strands:

- **STEM Skills and Connections:** A1.2, A1.4, A1.5, A2.2, A3.1, A3.2
- **Matter and Energy:** C1.1, C1.2, C2.1, C2.2, C2.3, C2.4, C2.5, C2.6, C2.7, C2.8
- **Earth and Space Systems:** E2.1

Examples of cross-curricular connections:

- **Language:** Oral Communication, Writing
- **Mathematics:** Number, Data
- **Geography:** Natural Resources Around the World: Use and Sustainability

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about the particle theory of matter, how to use particle theory to distinguish between pure substances and mixtures, how pure substances are elements and compounds consisting of atoms and combinations of atoms, and why water is referred to as the universal solvent.	C2.1, C2.2, C2.6, C2.8, E2.1
Students apply a scientific experimentation process to investigate saturated and unsaturated mixtures and solubility. They distinguish between homogenous and heterogenous mixtures, describe the concentration of saturated solutions, investigate factors that affect solubility, including heat, they record and organize their data using appropriate data collection and organization techniques. They communicate their findings, using vocabulary and various oral and text forms that are appropriate for a specific purpose and specific audiences.	A1.2, A1.4, A1.5, C2.3, C2.4, C2.5, E2.1 **Language:** Oral Communication, Writing **Mathematics:** Number, Data
Students apply a scientific experimentation process to investigate processes to separate mixtures and identify some applications of these processes. They connect this learning as they assess environmental and social impacts of different industrial methods used to separate mixtures.	A1.2, A1.4, A3.1, C1.2, C2.7
Students explore emerging technologies and the substances required to continue manufacturing various technologies that we use every day. They consider the use and disposal of pure substances found in technological devices, considering local and global perspectives, as well as potential solutions that are helping mitigate concerns surrounding electronic waste. They connect this learning to Geography as they apply geographic perspective to investigate issues related to the impact of extraction and use of natural resources around the world.	A2.2, A3.1, A3.2, C1.1 **Geography:** Natural Resources Around the World: Use and Sustainability

How are structures built to withstand forces?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.2, A1.3, A1.4, A1.5, A3.1, A3.2, A3.3
- **Structures and Mechanisms:** D1.1, D1.2, D2.1, D2.2, D2.3, D2.4, D2.5, D2.6, D2.7

Other strand:

- **Life Systems:** B1.1, B1.2

Examples of cross-curricular connections:

- **Geography:** Natural Resources Around the World: Use and Sustainability
- **Language:** Oral Communication, Writing
- **Mathematics:** Number, Data, Spatial Sense

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about classifying structures and the factors that can cause a structure to fail. They explore structures in their home, school, and community and they identify instances of symmetry in these structures. They also consider the structures that they interact with, such as desks and workspaces, and consider the impact of ergonomic design on health and safety.	D1.2, D2.1, D2.4, D2.5
Students apply a scientific experimentation process to investigate the ways in which the centre of gravity of a structure affects the structure's stability, and they apply learning from Mathematics to identify the magnitude, direction, point of application, and plane of application of the forces applied.	A1.2, A1.4, D2.2, D2.3 **Mathematics:** Number, Data

Skills and connections	Expectations and related curriculum
Students apply an engineering design process to build stable structures. They identify factors that determine the materials to be used and they describe and apply methods that engineers and those in the skilled trades use to assess, improve, and maintain the safety of structures. They connect this learning to Mathematics as they use data to refine their structures, and as they describe and represent shape, location, and movement by applying geometric properties and spatial relationships.	A1.3, A1.4, A1.5, A3.1, A3.2, D2.6, D2.7 **Language:** Oral Communication, Writing **Mathematics:** Number, Data, Spatial Sense
Students apply a scientific research process to evaluate environmental, social, and economic factors that should be considered when designing and building structures to meet specific needs for individuals and communities. They identify factors that determine the suitability of materials when constructing a structure, including the environmental, social, and economic considerations as they connect learning to Geography. They analyse the contributions of boatbuilding masters and the cultural transmission of knowledge in the design and construction of boats, including those from Inuit and Aleutian communities like kayaks built from light materials.	A1.1, A1.5, A3.3, B1.1, B1.2, D1.1, D2.6 **Geography:** Natural Resources Around the World: Use and Sustainability

How is heat generated and transmitted and how is it related to climate change?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.2, A1.4, A1.5, A2.2, A3.1, A3.2
- **Earth and Space Systems:** E1.1, E1.2, E2.1, E2.2, E2.3, E2.4, E2.5, E2.6, E2.7, E2.8

Other strand:

- **Matter and Energy:** C2.1

Examples of cross-curricular connections:

- **Language:** Oral Communication, Writing
- **Geography:** Natural Resources Around the World: Use and Sustainability

Skills and connections	Expectations and related curriculum
Students complete a range of introductory activities to learn about the ways in which heat is generated and how heat affects the motion of particles and the volume in solids, liquids, and gases.	C2.1, E2.1, E2.2, E2.3
Students apply the engineering design process to design and build a device or model of a residence that effectively uses heat transmission through conduction, convection, or radiation. They describe natural processes that are affected by conduction and convection and describe the effects of radiation from the Sun on different kinds of surfaces.	A1.2, A1.4, A1.5, A3.1, E2.4, E2.5, E2.6 **Language:** Oral Communication, Writing
Students apply a scientific research process to identify common sources of greenhouse gases and explain how greenhouse gases affect the transmission of radiated heat through the atmosphere. They analyse various social, economic, and environmental impacts, including impacts related to climate change and of using non-renewable sources of energy, and apply geographic perspective from Geography when exploring issues related to the extraction of natural resources.	A1.1, A1.5, A3.1, A3.2, E1.2, E2.7, E2.8 **Geography:** Natural Resources Around the World: Use and Sustainability
Students apply a scientific research process to assess the social and environmental benefits of technologies that reduce heat loss in enclosed spaces or heat transfer to surrounding spaces and they analyse various social, economic, and environmental impacts, including impacts related to climate change and of using renewable sources of energy. They connect this learning to Geography as they consider some responses to social and/or environmental challenges arising from the use of natural resources.	A1.1, A1.5, A2.2, A3.1, A3.2, E1.1, E1.2 **Geography:** Natural Resources Around the World: Use and Sustainability

Connections and consolidation

Science and Technology:

- Strand A: STEM Skills and Connections
- Strand B: Life Systems
- Strand C: Matter and Energy
- Strand D: Structures and Mechanisms
- Strand E: Earth and Space Systems

Examples of cross-curricular connections:

- **Language:** Oral Communication, Writing
- **Mathematics:** Number, Algebra, Data, Spatial Sense
- **Geography:** Natural Resources Around the World: Use and Sustainability

Students design and complete larger activities and projects that connect learning from a variety of Science and Technology strands and other subject areas in the grade to explore real-world problems and the practical applications of science and technology in their home and community.

They further develop their own STEM skills as they take a greater role in exploring components of scientific research, scientific experimentation, and engineering design processes to find answers and design solutions to problems that interest them and that affect their lives and communities.

Students apply a scientific research process to investigate unanswered questions they, or the class, may have. These questions can focus on mitigating the negative and enhancing the positive impact of human activities on the environment, with a focus on specific ecosystems. These human activities can include the design and construction of structures, the use and disposal of pure substances in various technologies, and the use of non-renewable and renewable sources of energy.

They engage in further components of the scientific experimentation process as they extend or build upon previous experiments. They consolidate their learning surrounding particle theory as they conduct experiments within the context of substances and mixtures, solubility, heat, and conduction, convection, and radiation.

Students engage in further components of the engineering design process as they refine or begin new designs focused on structures that can mitigate the negative impact of human activities on the environment, such as wildlife having to cross over or under a highway.

They apply coding skills as they focus on planning and designing larger programs that store and process data related to their experiments and engineering designs that model real world environmental monitoring systems, or that use physical devices to increase accessibility and ergonomics of programs or physical computing systems.

As students learn about real-world problems and the practical applications of Science and Technology concepts in these projects, they connect learning from Mathematics as they record, analyse, and communicate data, and from Geography as they consider natural resources and sustainability. They describe concepts and demonstrate their learning using vocabulary and formats that are appropriate for specific audiences and purposes.

Grade 8 – Science and Technology – Long-Range Plan

Topics, expectations, and related curriculum

What are cells and why should I care?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.2, A1.4, A1.5, A2.2, A3.2, A3.3
- **Life Systems:** B1.1, B1.2, B2.1, B2.2, B2.3, B2.4, B2.5, B2.6

Other strands:

- **Matter and Energy:** C2.10
- **Structures and Mechanisms:** D2.1, D2.2, D2.3, D2.10

Example of cross-curricular connections:

- **Health and Physical Education:** Active Living

Skills and connections	Expectations and related curriculum
Students complete a wide range of introductory activities to learn about basic structures, functions, and processes related to plant and animal cells while relating these concepts to society, the economy, and the environment by assessing the impacts of emerging technology and innovations in cell biology.	B1.1, B2.2, B2.3, B2.4
Students apply a scientific research and scientific experimentation process to conduct investigations related to plant and animal cells and unicellular and multicellular organisms. They communicate their findings using science and technology vocabulary and formats that are appropriate for specific audiences and purposes.	A1.1, A1.2, A1.4, A.1.5, B1.1, B2.2, B2.3, B2.5
The impacts of emerging technologies related to cell biology are analysed, as well as the practical, future applications of related technologies in their lives, as students consider the organization of cells into tissues, organs, and systems, and as they consider the health of various body systems by connecting learning from Active Living in Health and Physical Education.	A2.2, A3.2, B1.1, B1.2, B2.6 **Health and Physical Education:** Active Living
Students make connections to other strands in the Science and Technology curriculum by considering how cells are organized into systems, how these systems include inputs and outputs, how they compare to other systems, and how fluids are used and regulated in these systems. They analyse contributions to science and technology from various communities around the world who create vaccines to combat epidemics and pandemics (e.g., COVID-19, SARS, smallpox, polio, influenza) to support the communication, mobilization, and promotion of human health and well-being.	A3.3, B1.2, B2.1, B2.2, B2.4, B2.6, C2.10 D2.1, D2.2, D2.3, D2.10,

How do fluids flow and how does this flow impact the things around me?

Focus strands:

- **STEM Skills and Connections:** A1.2, A1.3, A1.4, A1.5, A2.2, A3.1
- **Matter and Energy:** C1.1, C1.2, C2.1, C2.2, C2.3, C2.4, C2.5, C2.6, C2.7, C2.8, C2.9, C2.10

Other strand:

- **Earth and Space Systems:** E1.3, E2.6

Examples of cross-curricular connections:

- **Language:** Oral Communication, Writing
- **Mathematics:** Number, Data
- **Geography:** Global Settlement: Patterns and Sustainability

Skills and connections	Expectations and related curriculum
Students complete a wide range of introductory activities to explore and understand basic fluid mechanics, including the properties and uses of fluids, while relating these concepts to society, the economy, and the environment by analysing the uses and impacts of various technologies that rely on the properties of fluids.	C1.1, C2.1, C2.2, C2.3, C2.4, C2.5, C2.6
Students apply a scientific experimentation process as they conduct a number of experiments to safely explore fluid-related concepts including flow rate, viscosity, mass, volume, density, compressibility, buoyancy, pressure, volume, and temperature. They integrate concepts from Mathematics as they collect, organize, and analyse data in order to draw conclusions about their findings.	A1.2, A1.4, A1.5, C2.1, C2.2, C2.3, C2.4, C2.5, C2.6, C2.8 **Mathematics:** Number, Data
Students apply an engineering design process to design and build a pneumatic or hydraulic system. They describe Pascal's law and its connections to the system, as well as how flow is regulated in the system.	A1.3, A1.4, A1.5, A3.1, C2.7, C2.8, C2.9, C2.10 **Language:** Oral Communication, Writing
Students assess the environmental and social impacts of fluid spills and how emerging technologies and innovations can help prevent, and/or minimize the impact of, these spills. Students can also connect learning from other subject areas, such as in Geography, as they consider environmental issues including spills and their connections to how human settlement affects the environment as well as the ways in which the physical environment and issues of sustainability may affect settlement in the future.	A2.2, C1.1, C1.2, E1.3, E2.6 **Geography:** Global Settlement: Patterns and Sustainability

What are efficient systems and how do they work in my life?

Focus strands:

- **STEM Skills and Connections:** A1.2, A1.4, A1.5, A2.1, A3.1
- **Structures and Mechanisms:** D1.1, D1.2, D2.1, D2.2, D2.3, D2.4, D2.5, D2.6, D2.7, D2.8, D2.9, D2.10

Examples of cross-curricular connections:

- **Geography:** Global Inequalities: Economic Development and Quality of Life
- **Language:** Oral Communication, Writing
- **Mathematics:** Number, Data

Skills and connections	Expectations and related curriculum
Students complete a wide range of introductory activities to explore and understand different types of systems, the factors that contribute to their safe and efficient operation, and the purposes, inputs, outputs, processes, and components of a variety of systems.	A1.4, D1.1, D1.2, D2.1, D2.2, D2.3, D2.8
Students apply an engineering design process to design and build a model of a mechanical system that replicates a real-life system used in the skilled trades or a related occupation. Students investigate the mechanical advantage of the system and use algebraic reasoning to describe the relationship between work, force, and displacement.	A1.2, A1.4, A1.5, D1.1, D2.4, D2.5, D2.6, D2.7 **Mathematics:** Number, Data
Students apply coding skills to develop and model automated computational or physical systems, including mechanical systems, that have increased productivity in various industries, such as a conveyor belt. They also assess the social, economic, and environmental impacts of these automated systems, including artificial intelligence systems.	A2.1, A3.1, D1.1, D2.2, D2.9

Skills and connections	Expectations and related curriculum
Students apply a scientific research process to investigate an emerging technology that represents a system in action. They describe the increases in productivity and the efficiencies of the system, the social factors that influence or will influence the evolution of the system, and they assess the social, economic, and environmental impact of the system. Students can also connect learning from other subject areas, such as in Geography as they consider the broader concept of systems as they explore political and economic systems in Global Inequalities: Economic Development and Quality of Life.	D1.1, D1.2, D2.9, D2.10 **Language:** Oral Communication, Writing **Geography:** Global Inequalities: Economic Development and Quality of Life

How can we protect Earth's water?

Focus strands:

- **STEM Skills and Connections:** A1.1, A1.2, A1.4, A1.5, A3.2, A3.3
- **Earth and Space Systems:** E1.1, E1.2, E1.3, E2.1, E2.2, E2.3, E2.4, E2.5, E2.6, E2.7

Other strand:

- **Structures and Mechanisms:** D2.1

Examples of cross-curricular connections:

- **Geography:** Global Settlement: Patterns and Sustainability
- **Mathematics:** Number, Data

Skills and connections	Expectations and related curriculum
Students complete a wide range of introductory activities to learn about fundamental concepts related to water on Earth's surface, watersheds, atmospheric conditions, and how human activity and natural phenomena cause changes in water systems.	D2.1, E2.1, E2.2, E2.3, E2.4, E2.5,
Students apply a scientific experimentation process using appropriate data collection and organization techniques as they investigate indicators of water quality and ways to process water.	A1.2, A1.4, A1.5, E2.6, E2.7 **Mathematics:** Number, Data
Students apply a scientific research process to investigate issues of climate change on local and global water systems. They consider the future and connect climate change concerns to other subject areas, such as Geography as they consider the connections between potential changes to Earth's water systems and how issues of sustainability may affect settlement in the future in Global Settlement: Patterns and Sustainability.	A1.1, A1.5, E2.3, E2.4 **Geography:** Global Settlement: Patterns and Sustainability
Students analyse contributions to science and technology from various communities and demonstrate an understanding of First Nations, Métis, and Inuit knowledges and values about water, connections to water, and ways of managing water resources sustainably. They assess the social and environmental impact of the scarcity of fresh water and changes in the water table, and they propose a plan of action that incorporates scientific discoveries and technological innovations that can help address scarcity issues.	A3.2, A3.3, E1.1, E1.2, E1.3, E2.3

Connections and consolidation

Science and Technology:

- Strand A: STEM Skills and Connections
- Strand B: Life Systems
- Strand C: Matter and Energy

- Strand D: Structures and Mechanisms
- Strand E: Earth and Space Systems

Examples of cross-curricular connections:

- **Geography:** Global Settlements and Global Inequalities
- **Health and Physical Education:** Active Living
- **Language:** Oral Communication, Writing
- **Mathematics:** Number, Data

Students design and complete larger activities and projects that connect learning from a variety of Science and Technology strands and other subject areas in the grade to explore real-world problems and the practical applications of Science and Technology concepts in various occupations, including the skilled trades.

They further develop their own STEM skills as they take a greater role in implementing scientific research, scientific experimentation, and engineering design processes to find answers and design solutions to problems that interest them and that affect their lives and communities.

Students apply a scientific research or scientific experimentation process to investigate unanswered questions they, or the class, may have related to topics in the year. This may include topics such as how technologies and occupations related to cell biology, fluids, and water systems are helping to solve problems associated with human health.

They apply a scientific experimentation process to explore concepts related to flow rate and viscosity that help improve the efficiency of a larger water management system.

Students apply an engineering design process to design and build a model of a larger water system that uses the properties of fluids to pump and redirect water in a controlled manner. Coding can be applied to control automated components of the system, such as a dam in a model of a waterway, or a pump or sensor in a plant watering system.

The important theme of Earth's water systems and water management, distribution, and use is explored as a context that provides opportunities for students to connect learning from the various strands to climate change, sustainability, skilled trades occupations, and emerging technologies. They analyse contributions to science and technology from various communities and connect learning from other subject areas including Healthy Living in Health and Physical Education, Number and Data in Mathematics, and Global Settlements and Inequalities in Geography.