THE ONTARIO CURRICULUM

GRADES 1–8

Science and Technology 2022

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- the Program Planning and Assessment and Evaluation sections of the Curriculum and Resources website that apply to all Ontario curriculum, Grades 1–12;
- the Curriculum Context that is specific to a discipline;
- the strands of the curriculum; and
- glossaries and appendices as applicable.

The Ontario Curriculum Grades 1–8: Science and Technology, 2022

This curriculum policy replaces *The Ontario Curriculum, Grades 1–8: Science and Technology, 2007*. Beginning in September 2022, all science and technology programs for Grades 1 to 8 will be based on the expectations outlined in this curriculum policy.

Version History:

Version Date	**Description**
March 08, 2022	Revised curriculum issued

Program Planning and Assessment and Evaluation Content

Last updated: June 2023

This content is part of official issued curriculum providing the most up-to-date information (i.e., front matter). This content is applicable to all curriculum documents, Grades 1 to 12. Educators must consider this information to guide the implementation of curriculum and in creating the environment in which it is taught.

This curriculum policy replaces *The Ontario Curriculum, Grades 1–8: Science and Technology, 2007*. Beginning in September 2022, all science and technology programs for Grades 1 to 8 will be based on the expectations outlined in this curriculum policy.

Contents

Une publication équivalente est disponible en français sous le titre suivant : *Le curriculum de l'Ontario de la 1re à la 8e année – Sciences et technologie* (2022)

Science and Technology, Grade 1

Expectations by strand

A. STEM Skills and Connections

This strand focuses on science, technology, engineering, and mathematics (STEM) skills, coding and emerging technologies, practical applications of science and technology, and contributions that people with diverse lived experiences have made to science and technology. In all grades of the science and technology program, the learning related to this strand takes place in the context of learning related to the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, and it should be assessed and evaluated within these contexts.

Overall expectations

Throughout Grade 1, in connection with the learning in the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, students will:

A1. STEM Investigation and Communication Skills

use a scientific research process, a scientific experimentation process, and an engineering design process to conduct investigations, following appropriate health and safety procedures

Specific expectations

Throughout Grade 1, in connection with the learning in the other strands, students will:

A1.1 use a scientific research process and associated skills to conduct investigations

A1.2 use a scientific experimentation process and associated skills to conduct investigations

A1.3 use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems

A1.4 follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials

A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes

A2. Coding and Emerging Technologies

use coding in investigations and to model concepts, and assess the impact of coding and of emerging technologies on everyday life

Specific expectations

Throughout Grade 1, in connection with the learning in the other strands, students will:

A2.1 write and execute code in investigations and when modelling concepts, with a focus on creating clear and precise instructions for simple algorithms

A2.2 identify and describe impacts of coding and of emerging technologies on everyday life

A3. Applications, Connections, and Contributions

demonstrate an understanding of the practical applications of science and technology, and of contributions to science and technology from people with diverse lived experiences

Specific expectations

Throughout Grade 1, in connection with the learning in the other strands, students will:

A3.1 describe practical applications of science and technology concepts in their home and community, and how these applications address real-world problems

A3.2 investigate how science and technology can be used with other subject areas to address real-world problems

A3.3 analyse contributions to science and technology from various communities

B. Life Systems

Needs and Characteristics of Living Things

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 1, students will:

B1. Relating Science and Technology to Our Changing World

assess the importance of a healthy environment for living and non-living things, and the responsibilities of humans in contributing to a healthy environment

Specific expectations

By the end of Grade 1, students will:

Needs and Characteristics of Living Things

B1.1 describe changes or problems that could result from the loss of living and non-living things that are part of everyday life, while taking different perspectives into consideration

B1.2 identify actions that can be taken to contribute to a healthy environment

B2. Exploring and Understanding Concepts

demonstrate an understanding of the basic needs and characteristics of living things, including humans

Specific expectations

By the end of Grade 1, students will:

Needs and Characteristics of Living Things

B2.1 demonstrate an understanding of the natural environment as a place where living and non-living things are interconnected

B2.2 identify the basic needs of living things, including the need for air, water, food, heat, shelter, and space

B2.3 identify the physical characteristics of various plants and animals, including humans, and explain how these characteristics help the plants and animals meet their basic needs

B2.4 identify the location and the function of various parts of the human body, including sensory organs

B2.5 describe the characteristics of a healthy environment, including clean air and water and nutritious food, and how a healthy environment enables living things to meet their needs

B2.6 describe ways in which living things provide for the needs of other living things

C. Matter and Energy

Energy in Our Lives

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 1, students will:

C1. Relating Science and Technology to Our Changing World

assess uses of energy at home, at school, and in the community, and suggest ways to use energy responsibly

Specific expectations

By the end of Grade 1, students will:

Energy in Our Lives

C1.1 describe everyday uses of energy at school and at home, and suggest ways to use energy responsibly

C1.2 describe how the lives of people and other living things would be affected if electrical energy were no longer available

C2. Exploring and Understanding Concepts

demonstrate an understanding of how energy affects their lives, and that the Sun is the principal source of energy for Earth

Specific expectations

By the end of Grade 1, students will:

Energy in Our Lives

C2.1 demonstrate an understanding that energy is the ability to move or change something

C2.2 demonstrate an understanding that the Sun is Earth's principal source of energy, including how it warms the air, land, and water; is a source of light for Earth; and makes it possible for plants to grow

C2.3 identify food as a source of energy for living things

C2.4 identify everyday uses of various sources of energy

C2.5 demonstrate an understanding that humans get the energy resources they need from the world around them, and that the supply of many of these resources is limited

C2.6 describe seasonal differences in how we use energy and in the forms of energy we use

D. Structures and Mechanisms

Everyday Materials, Objects, and Structures

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 1, students will:

D1. Relating Science and Technology to Our Changing World

assess the impact on people and the environment of everyday objects, including structures, and the materials they are made of

Specific expectations

By the end of Grade 1, students will:

Everyday Materials, Objects, and Structures

D1.1 identify the kinds of waste materials produced by humans, and plan and carry out a course of action for minimizing waste in the classroom or at home, explaining why each action is important

D1.2 assess everyday objects, including structures, that have similar purposes, in terms of the materials they are made from, the source of these materials, and what happens to these objects when they are worn out or no longer needed

D2. Exploring and Understanding Concepts

demonstrate an understanding that objects, including structures, have observable characteristics and are made from materials with specific properties that determine how they are used

Specific expectations

By the end of Grade 1, students will:

Everyday Materials, Objects, and Structures

D2.1 describe objects as things that are made of one or more materials

D2.2 identify structures that are objects designed to support a load, including those acting as supporting frameworks for objects

D2.3 identify materials that are used to make various everyday objects, including structures

D2.4 describe observable characteristics of various everyday objects, including structures, using qualitative information gathered through their senses

D2.5 describe purposes of everyday objects, including structures

D2.6 identify properties of materials that enable the objects made from them to perform their intended function

D2.7 identify different kinds of fasteners and describe uses for each

D2.8 identify sources in nature of some common materials that are used to make various objects, including structures

E. Earth and Space Systems

Daily and Seasonal Changes

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 1, students will:

E1. Relating Science and Technology to Our Changing World

assess the impact of daily and seasonal changes on living things, including humans

Specific expectations

By the end of Grade 1, students will:

Daily and Seasonal Changes

E1.1 assess the impact of daily and seasonal changes on human outdoor activities, and identify innovations that enable people to engage in various activities year-round

E1.2 assess ways in which daily and seasonal changes have an impact on society, the environment, and living things in the natural environment

E2. Exploring and Understanding Concepts

demonstrate an understanding of daily and seasonal changes and of how living things respond to those changes

Specific expectations

By the end of Grade 1, students will:

Daily and Seasonal Changes

E2.1 demonstrate an understanding of Earth's relationship to the Sun and that this relationship results in daily and seasonal changes on Earth

E2.2 demonstrate an understanding that a cycle is a series of repeating events, and that cycles can be observed in daily and seasonal changes

E2.3 describe the changes in the amount of light and heat from the Sun that occur throughout the day and in the four seasons

E2.4 describe and compare the four seasons in terms of the weather, including precipitation and temperature, in their local area

E2.5 describe changes in the appearance or behaviour of living things that are adaptations to seasonal changes

E2.6 describe how humans prepare for, and respond to, daily and seasonal changes

Information for parents

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Science and Technology, Grade 2

Expectations by strand

A. STEM Skills and Connections

This strand focuses on science, technology, engineering, and mathematics (STEM) skills, coding and emerging technologies, practical applications of science and technology, and contributions that people with diverse lived experiences have made to science and technology. In all grades of the science and technology program, the learning related to this strand takes place in the context of learning related to the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, and it should be assessed and evaluated within these contexts.

Overall expectations

Throughout Grade 2, in connection with the learning in the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, students will:

A1. STEM Investigation and Communication Skills

use a scientific research process, a scientific experimentation process, and an engineering design process to conduct investigations, following appropriate health and safety procedures

Specific expectations

Throughout Grade 2, in connection with the learning in the other strands, students will:

A1.1 use a scientific research process and associated skills to conduct investigations

A1.2 use a scientific experimentation process and associated skills to conduct investigations

A1.3 use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems

A1.4 follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials

A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes

A2. Coding and Emerging Technologies

use coding in investigations and to model concepts, and assess the impact of coding and of emerging technologies on everyday life

Specific expectations

Throughout Grade 2, in connection with the learning in the other strands, students will:

A2.1 write and execute code in investigations and when modelling concepts, with a focus on decomposing problems into smaller steps

A2.2 identify and describe impacts of coding and of emerging technologies on everyday life

A3. Applications, Connections, and Contributions

demonstrate an understanding of the practical applications of science and technology, and of contributions to science and technology from people with diverse lived experiences

Specific expectations

Throughout Grade 2, in connection with the learning in the other strands, students will:

A3.1 describe practical applications of science and technology concepts in their home and community, and how these applications address real-world problems

A3.2 investigate how science and technology can be used with other subject areas to address real-world problems

A3.3 analyse contributions to science and technology from various communities

B. Life Systems

Growth and Changes in Animals

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 2, students will:

B1. Relating Science and Technology to Our Changing World

assess ways in which animals have an impact on society and the environment, and ways in which human activities have an impact on animals and the places where they live

Specific expectations

By the end of Grade 2, students will:

Growth and Changes in Animals

B1.1 examine impacts that animals can have on society and the environment, and describe some ways in which any negative impacts can be minimized

B1.2 assess impacts of various human activities on animals and the places where they live, and describe practices that can minimize negative impacts

B2. Exploring and Understanding Concepts

demonstrate an understanding that animals grow and change and have distinct characteristics

Specific expectations

By the end of Grade 2, students will:

Growth and Changes in Animals

B2.1 compare physical characteristics of various animals, including characteristics that are constant and those that change

B2.2 describe the locomotion of various animals

B2.3 describe the life cycle of a variety of animals, including insects, amphibians, birds, and mammals

B2.4 compare changes in the appearance and behaviour of various animals as they go through a complete life cycle

B2.5 describe adaptations, including physical and/or behavioural characteristics, that allow various animals to survive in their natural environment

C. Matter and Energy

Properties of Liquids and Solids

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 2, students will:

C1. Relating Science and Technology to Our Changing World

assess ways in which liquids and solids and their uses can have an impact on society and the environment

Specific expectations

By the end of Grade 2, students will:

Properties of Liquids and Solids

C1.1 assess practices related to the use, storage, and disposal of liquids and solids in the home in terms of the effects on personal health and safety and on the environment, and suggest ways to improve these practices

C1.2 assess the impacts of changes of state of liquids and solids on humans and on environments

C2. Exploring and Understanding Concepts

demonstrate an understanding of the properties and physical changes of liquids and solids

Specific expectations

By the end of Grade 2, students will:

Properties of Liquids and Solids

C2.1 identify various types of matter in natural and built environments as liquids or solids

C2.2 describe the properties of liquids and solids

C2.3 describe properties of liquid water and solid water, and identify the conditions that cause changes from one state to the other

C2.4 identify conditions in which the states of liquids and solids remain constant and conditions that can cause their states to change

C2.5 describe some ways in which liquids and solids can be combined to make useful mixtures

C2.6 classify solid objects and materials in terms of their buoyancy and in terms of their ability to absorb or repel water

C2.7 explain the meaning of international symbols that give us information on the safety of substances

D. Structures and Mechanisms

Simple Machines and Movement

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 2, students will:

D1. Relating Science and Technology to Our Changing World

assess the impact of simple machines on society and on the environment

Specific expectations

By the end of Grade 2, students will:

Simple Machines and Movement

D1.1 assess the impact of simple machines on the daily lives of people in various communities

D1.2 assess the impact on the environment of technologies that use simple machines to facilitate movement

D2. Exploring and Understanding Concepts

demonstrate an understanding of movement and ways in which simple machines help to move objects

Specific expectations

By the end of Grade 2, students will:

Simple Machines and Movement

D2.1 describe different ways an object can move

D2.2 identify ways in which the position of an object can be changed

D2.3 identify the six basic types of simple machines: lever, inclined plane, wedge, pulley, wheel and axle, and screw

D2.4 describe ways in which each type of simple machine is used in daily life to make tasks easier

D2.5 compare, qualitatively or quantitatively, the force required to move an object using various simple machines to the force required to move the object without using a simple machine

E. Earth and Space Systems

Air and Water in the Environment

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 2, students will:

E1. Relating Science and Technology to Our Changing World

assess ways in which the actions of humans have an impact on the quality of air and water, and create plans to protect these resources

Specific expectations

By the end of Grade 2, students will:

Air and Water in the Environment

E1.1 assess the impact of human activities on air and water, taking various perspectives into consideration, including those of First Nations, Métis, and Inuit, and plan a course of action to protect the quality of the air and/or water in the local community

E1.2 assess their personal and household uses of water, and create a plan to use water responsibly

E1.3 examine the availability of fresh water and drinking water around the world, and describe the impact on communities

E2. Exploring and Understanding Concepts

demonstrate an understanding of the properties of air and water, including water in various states, and of ways in which living things depend on air and water for their survival

Specific expectations

By the end of Grade 2, students will:

Air and Water in the Environment

E2.1 demonstrate an understanding of the key properties of air and water

E2.2 identify sources of water in the natural and built environments

E2.3 describe the stages of the water cycle, including evaporation, condensation, precipitation, and collection

E2.4 identify the three states of water in the environment, and describe how temperature changes affect the state of water within the water cycle

E2.5 describe ways in which living things, including humans, depend on air and water

Information for parents

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Science and Technology, Grade 3

Expectations by strand

A. STEM Skills and Connections

This strand focuses on science, technology, engineering, and mathematics (STEM) skills, coding and emerging technologies, practical applications of science and technology, and contributions that people with diverse lived experiences have made to science and technology. In all grades of the science and technology program, the learning related to this strand takes place in the context of learning related to the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, and it should be assessed and evaluated within these contexts.

Overall expectations

Throughout Grade 3, in connection with the learning in the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, students will:

A1. STEM Investigation and Communication Skills

use a scientific research process, a scientific experimentation process, and an engineering design process to conduct investigations, following appropriate health and safety procedures

Specific expectations

Throughout Grade 3, in connection with the learning in the other strands, students will:

A1.1 use a scientific research process and associated skills to conduct investigations

A1.2 use a scientific experimentation process and associated skills to conduct investigations

A1.3 use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems

A1.4 follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials

A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes

A2. Coding and Emerging Technologies

use coding in investigations and to model concepts, and assess the impact of coding and of emerging technologies on everyday life

Specific expectations

Throughout Grade 3, in connection with the learning in the other strands, students will:

A2.1 write and execute code in investigations and when modelling concepts, with a focus on testing, debugging, and refining programs

A2.2 identify and describe impacts of coding and of emerging technologies on everyday life

A3. Applications, Connections, and Contributions

demonstrate an understanding of the practical applications of science and technology, and of contributions to science and technology from people with diverse lived experiences

Specific expectations

Throughout Grade 3, in connection with the learning in the other strands, students will:

A3.1 describe practical applications of science and technology concepts in their home and community, and how these applications address real-world problems

A3.2 investigate how science and technology can be used with other subject areas to address real-world problems

A3.3 analyse contributions to science and technology from various communities

B. Life Systems

Growth and Changes in Plants

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 3, students will:

B1. Relating Science and Technology to Our Changing World

assess ways in which plants are beneficial to society and the environment, and ways in which human activity has an impact on plants and plant habitats

Specific expectations

By the end of Grade 3, students will:

Growth and Changes in Plants

B1.1 assess ways in which plants are important to humans and other living things, taking different perspectives into consideration, and identify ways in which humans can protect native plant species and their habitats

B1.2 assess ways in which human activities have an impact on plants and plant habitats, and identify personal actions that they could take to minimize harmful effects and enhance positive ones

B1.3 assess the benefits and limitations of locally grown food

B2. Exploring and Understanding Concepts

demonstrate an understanding of characteristics and uses of plants and of plants' responses to the natural environment

Specific expectations

By the end of Grade 3, students will:

Growth and Changes in Plants

B2.1 describe the basic needs of plants, including the need for air, water, light, heat, nutrients, and space, and identify environmental conditions that may threaten plant survival

B2.2 identify different parts of plants, including the root, stem, flower, stamen, pistil, leaf, seed, cone, and fruit, and describe how each part contributes to plants' survival within their environment

B2.3 describe changes that different plants undergo in their life cycles

B2.4 describe ways in which a variety of plants adapt and/or react to their environment and to changes in their environment

B2.5 demonstrate an understanding that most plants get energy directly from the Sun through the process of photosynthesis, which involves the absorption of carbon dioxide and the release of oxygen

B2.6 describe ways in which people, including Indigenous peoples, from various cultures around the world use plants for food, shelter, medicine, and clothing

B2.7 describe various plants used for food, including those grown by First Nations, Métis, and Inuit, and identify local settings where these plants are grown or found

B2.8 describe ways in which plants and animals, including humans, depend on each other

C. Matter and Energy

Forces and Motion

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 3, students will:

C1. Relating Science and Technology to Our Changing World

assess the impacts of various forces on society and the environment

Specific expectations

By the end of Grade 3, students will:

Forces and Motion

C1.1 assess the effects of the action of forces from natural phenomena on natural and built environments, and identify ways in which human activities can reduce or enhance these effects

C1.2 assess harmful effects of forces that may result from various human activities, and describe how health and safety devices can minimize these effects

C2. Exploring and Understanding Concepts

demonstrate an understanding of how forces cause motion and changes in motion

Specific expectations

By the end of Grade 3, students will:

Forces and Motion

C2.1 describe different types of contact forces and non-contact forces

C2.2 describe different ways a force can be exerted on an object

C2.3 describe how different forces applied to an object, including forces of varying magnitude, can cause the object to start, stop, or change its direction, speed, or shape

C2.4 identify ways in which forces are used in their daily lives

D. Structures and Mechanisms

Strong and Stable Structures

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 3, students will:

D1. Relating Science and Technology to Our Changing World

assess the importance of form, function, strength, and stability in structures to society and the environment

Specific expectations

By the end of Grade 3, students will:

Strong and Stable Structures

D1.1 assess effects on society and the environment of strong and stable structures

D1.2 assess the environmental impact of structures built by various animals, including structures built by humans

D2. Exploring and Understanding Concepts

demonstrate an understanding of the concepts of *strength* and *stability* as they relate to structures with various forms and functions, and of the factors that affect structures' strength and stability

Specific expectations

By the end of Grade 3, students will:

Strong and Stable Structures

D2.1 describe a structure as a supporting framework that holds a load and has a definite size, shape, and function, and identify structures in the natural environment and in the built environment

D2.2 demonstrate an understanding of the relationship between form and function for various structures

D2.3 identify the strength of a structure as its ability to support a load and describe ways to increase the strength of structures, including ways to increase the strength of different materials used to build them

D2.4 describe the stability of a structure as its ability to keep its shape, maintain balance, float, and/or stay fixed in one spot when a force is applied to the structure, and describe ways to improve a structure's stability

D2.5 identify properties of materials that need to be considered when building structures

D2.6 describe ways in which different forces can affect the shape, balance, or position of structures

D2.7 explain the role of struts and ties in structures under load

E. Earth and Space Systems

Soils in the Environment

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 3, students will:

E1. Relating Science and Technology to Our Changing World

assess the importance of soils for society and the environment, and the impact of human activity on soils

Specific expectations

By the end of Grade 3, students will:

Soils in the Environment

E1.1 assess the importance of soils for society and the environment

E1.2 assess the impact of human activity on soils, and describe ways in which humans can improve the quality of soils and/or lessen or prevent harmful effects on soils

E2. Exploring and Understanding Concepts

demonstrate an understanding of the composition of soils, of different types of soils, and of processes and practices that can affect the health of soil

Specific expectations

By the end of Grade 3, students will:

Soils in the Environment

E2.1 identify the living and non-living components of soil, and describe the characteristics of healthy soil

E2.2 identify different substances that are commonly added to, or absorbed by, the soil, and describe their effects on soil health

E2.3 examine different types of soils found in Ontario, and describe how different soils are suited to growing different types of food, including crops

E2.4 explain the process of erosion, including its causes and its impact on soils

E2.5 identify various strategies used to maintain and improve soil health in Ontario

E2.6 describe the process of composting, and explain some benefits of composting

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Science and Technology, Grade 4

Expectations by strand

A. STEM Skills and Connections

This strand focuses on science, technology, engineering, and mathematics (STEM) skills, coding and emerging technologies, practical applications of science and technology, and contributions that people with diverse lived experiences have made to science and technology. In all grades of the science and technology program, the learning related to this strand takes place in the context of learning related to the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, and it should be assessed and evaluated within these contexts.

Overall expectations

Throughout Grade 4, in connection with the learning in the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, students will:

A1. STEM Investigation and Communication Skills

use a scientific research process, a scientific experimentation process, and an engineering design process to conduct investigations, following appropriate health and safety procedures

Specific expectations

Throughout Grade 4, in connection with the learning in the other strands, students will:

A1.1 use a scientific research process and associated skills to conduct investigations

A1.2 use a scientific experimentation process and associated skills to conduct investigations

A1.3 use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems

A1.4 follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials

A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes

A2. Coding and Emerging Technologies

use coding in investigations and to model concepts, and assess the impact of coding and of emerging technologies on everyday life and in STEM-related fields

Specific expectations

Throughout Grade 4, in connection with the learning in the other strands, students will:

A2.1 write and execute code in investigations and when modelling concepts, with a focus on producing different types of output for a variety of purposes

A2.2 identify and describe impacts of coding and of emerging technologies on everyday life, including skilled trades

A3. Applications, Connections, and Contributions

demonstrate an understanding of the practical applications of science and technology, and of contributions to science and technology from people with diverse lived experiences

Specific expectations

Throughout Grade 4, in connection with the learning in the other strands, students will:

A3.1 describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems

A3.2 investigate how science and technology can be used with other subject areas to address real-world problems

A3.3 analyse contributions to science and technology from various communities

B. Life Systems

Habitats and Communities

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 4, students will:

B1. Relating Science and Technology to Our Changing World

assess impacts of human activities on habitats and communities, and analyse actions for minimizing negative impacts and enhancing positive ones

Specific expectations

By the end of Grade 4, students will:

Habitats and Communities

B1.1 assess positive and negative impacts of human activities on habitats and communities, while taking different perspectives into account

B1.2 analyse the impact of the depletion or extinction of a species on its habitat and community, and describe possible actions to prevent such depletions or extinctions

B2. Exploring and Understanding Concepts

demonstrate an understanding of habitats and communities and of interrelationships among the organisms that live in them

Specific expectations

By the end of Grade 4, students will:

Habitats and Communities

B2.1 describe habitats as areas that provide organisms, including plants and animals, with the necessities of life, and identify ways in which a local habitat provides these necessities

B2.2 describe a community as a group of interacting species sharing a common habitat, and identify factors that affect the ability of a community of plants and animals to survive in a local habitat

B2.3 describe the relationship of organisms in a food chain, and classify organisms as producers, consumers, or decomposers

B2.4 demonstrate an understanding of a food web as the interconnection of multiple food chains in a natural community

B2.5 describe how animals are categorized according to their diet, and categorize various animals as carnivores, herbivores, or omnivores

B2.6 describe structural adaptations of a variety of plants and animals and how these adaptations allow the organisms to survive in specific habitats

B2.7 explain why all habitats have limits to the number of plants and animals they can support

C. Matter and Energy

Light and Sound

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 4, students will:

C1. Relating Science and Technology to Our Changing World

assess the impacts on society and the environment of technological innovations related to light and sound

Specific expectations

By the end of Grade 4, students will:

Light and Sound

C1.1 assess the impacts on society of devices that use the properties of light or sound, or both

C1.2 assess the impacts on the environment of light energy and sound energy produced by various technologies, while taking different perspectives into account

C2. Exploring and Understanding Concepts

demonstrate an understanding of light and sound as forms of energy that have specific characteristics and properties

Specific expectations

By the end of Grade 4, students will:

Light and Sound

C2.1 identify a variety of natural and artificial light sources

C2.2 distinguish between objects and living things that emit their own light and those that reflect light from other sources

C2.3 describe properties of light, including that light travels in a straight path and that light can be absorbed, reflected, and refracted

C2.4 describe properties of sound, including that sound travels through a medium as a wave and that sound can be absorbed or reflected and modified

C2.5 explain how vibrations cause sound waves

C2.6 describe how different objects and materials interact with light and sound energy

C2.7 distinguish between sources of light that emit both light and heat and those that emit light but little heat

C2.8 identify sensory organs and devices that make use of the properties of light and sound

D. Structures and Mechanisms

Machines and Their Mechanisms

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 4, students will:

D1. Relating Science and Technology to Our Changing World

evaluate the impacts of various machines and their mechanisms on society and the environment

Specific expectations

By the end of Grade 4, students will:

Machines and Their Mechanisms

D1.1 assess the impacts of machines and their mechanisms on the daily lives of people in various communities

D1.2 assess and compare the environmental impacts of using different machines designed for similar purposes

D2. Exploring and Understanding Concepts

demonstrate an understanding of the basic principles and functions of machines and their mechanisms

Specific expectations

By the end of Grade 4, students will:

Machines and Their Mechanisms

D2.1 identify machines that are used in daily life, and describe their purposes

D2.2 identify the parts of various mechanisms and describe the purpose of each part

D2.3 describe how different mechanisms transmit various types of motion, including rotary motion, from one system to another

D2.4 describe how mechanisms transform motion, including how they can change the geometric plane in which the motion occurs and the speed and/or direction of motion

D2.5 explain how forces are changed in a variety of machines

E. Earth and Space Systems

Rocks, Minerals, and Geological Processes

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 4, students will:

E1. Relating Science and Technology to Our Changing World

assess the social and environmental impacts of geological processes and of human uses of rocks and minerals

Specific expectations

By the end of Grade 4, students will:

Rocks, Minerals, and Geological Processes

E1.1 analyse ways in which geological processes impact society and the environment

E1.2 assess social and environmental impacts of extracting and refining rocks and minerals and of manufacturing, recycling, and disposing of products derived from rocks and minerals, while taking various perspectives into account

E2. Exploring and Understanding Concepts

demonstrate an understanding of rocks, minerals, and Earth's geological processes

Specific expectations

By the end of Grade 4, students will:

Rocks, Minerals, and Geological Processes

E2.1 explain geological processes that result in the formation of igneous, sedimentary, and metamorphic rocks, using the rock cycle

E2.2 describe the physical properties of igneous, sedimentary, and metamorphic rocks

E2.3 classify different rocks and minerals according to their composition and physical properties, using various tests and criteria

E2.4 describe everyday uses of rocks and minerals

E2.5 describe how fossils are formed and what information they can provide about Earth's history

E2.6 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

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Science and Technology, Grade 5

Expectations by strand

A. STEM Skills and Connections

This strand focuses on science, technology, engineering, and mathematics (STEM) skills, coding and emerging technologies, practical applications of science and technology, and contributions that people with diverse lived experiences have made to science and technology. In all grades of the science and technology program, the learning related to this strand takes place in the context of learning related to the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, and it should be assessed and evaluated within these contexts.

Overall expectations

Throughout Grade 5, in connection with the learning in the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, students will:

A1. STEM Investigation and Communication Skills

use a scientific research process, a scientific experimentation process, and an engineering design process to conduct investigations, following appropriate health and safety procedures

Specific expectations

Throughout Grade 5, in connection with the learning in the other strands, students will:

A1.1 use a scientific research process and associated skills to conduct investigations

A1.2 use a scientific experimentation process and associated skills to conduct investigations

A1.3 use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems

A1.4 follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials

A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes

A2. Coding and Emerging Technologies

use coding in investigations and to model concepts, and assess the impact of coding and of emerging technologies on everyday life and in STEM-related fields

Specific expectations

Throughout Grade 5, in connection with the learning in the other strands, students will:

A2.1 write and execute code in investigations and when modelling concepts, with a focus on using different methods to store and process data for a variety of purposes

A2.2 identify and describe impacts of coding and of emerging technologies on everyday life, including skilled trades

A3. Applications, Connections, and Contributions

demonstrate an understanding of the practical applications of science and technology, and of contributions to science and technology from people with diverse lived experiences

Specific expectations

Throughout Grade 5, in connection with the learning in the other strands, students will:

A3.1 describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems

A3.2 investigate how science and technology can be used with other subject areas to address real-world problems

A3.3 analyse contributions to science and technology from various communities

B. Life Systems

Human Health and Body Systems

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 5, students will:

B1. Relating Science and Technology to Our Changing World

analyse impacts of various social and environmental factors, human activities, and technologies on human health

Specific expectations

By the end of Grade 5, students will:

Human Health and Body Systems

B1.1 assess effects of a variety of social and environmental factors on human health, and describe ways in which individuals can reduce the harmful effects of these factors and take advantage of those that are beneficial

B1.2 evaluate beneficial and harmful effects of various technologies on human health and body systems, while taking different perspectives into consideration

B1.3 explain how food literacy can support decisions that affect physical and mental health

B2. Exploring and Understanding Concepts

demonstrate an understanding of the structure and function of human body systems and interactions within and between systems

Specific expectations

By the end of Grade 5, students will:

Human Health and Body Systems

B2.1 identify systems of the human body, and describe their basic function

B2.2 describe the basic structure and function of vital organs in various systems in the human body

B2.3 describe interrelationships between human body systems

B2.4 identify various diseases and medical disorders in humans and the organs and/or body system or systems that they affect

C. Matter and Energy

Properties of and Changes in Matter

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 5, students will:

C1. Relating Science and Technology to Our Changing World

assess the impacts on society and the environment of various processes and materials used in the manufacture of common products, and ways to mitigate negative impacts

Specific expectations

By the end of Grade 5, students will:

Properties of and Changes in Matter

C1.1 assess the impacts on society and the environment of various processes used in the manufacture of common products

C1.2 assess how the use of specific materials in the manufacture of common products affects the environment, and identify actions that society and individuals can take to mitigate negative impacts

C2. Exploring and Understanding Concepts

demonstrate an understanding of the properties of matter, changes of state, and physical and chemical change

Specific expectations

By the end of Grade 5, students will:

Properties of and Changes in Matter

C2.1 describe matter as everything that has mass and occupies volume

C2.2 identify the states of matter, and describe characteristics and properties of solids, liquids, and gases

C2.3 describe changes of state of matter observed at home, in the community, or in the natural environment

C2.4 describe physical changes in matter as changes of the state, volume, or form of the matter that do not result in the formation of a different substance

C2.5 describe chemical changes in matter as changes that result in the formation of different substances, and identify signs that a chemical change has occurred

C2.6 explain how changes of state can occur when matter absorbs or releases thermal energy

C2.7 explain why specific physical properties of various solids, liquids, and gases make them useful for particular applications

D. Structures and Mechanisms

Forces Acting on Structures

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 5, students will:

D1. Relating Science and Technology to Our Changing World

analyse social and environmental impacts of forces acting on structures, and assess ways to mitigate these impacts

Specific expectations

By the end of Grade 5, students will:

Forces Acting on Structures

D1.1 analyse the effects of forces from natural phenomena on structures in natural and built environments

D1.2 assess various ways in which humans mitigate impacts of forces from natural phenomena on structures in urban, rural, and remote communities

D2. Exploring and Understanding Concepts

demonstrate an understanding of forces that act on structures, and how various structures withstand them

Specific expectations

By the end of Grade 5, students will:

Forces Acting on Structures

D2.1 identify internal forces acting on a structure, and describe their effects on the structure

D2.2 identify external forces acting on a structure, and describe their effects on the structure

D2.3 describe forces resulting from natural phenomena that can have severe consequences for human-built structures, and identify structural features and materials that can allow such structures to withstand these forces

D2.4 describe ways in which physical characteristics of various animal and plant species help to protect them from potentially harmful effects of forces

D2.5 describe ways in which protective equipment helps to protect humans from potentially harmful effects of forces

E. Earth and Space Systems

Conservation of Energy and Resources

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 5, students will:

E1. Relating Science and Technology to Our Changing World

assess effects of energy and resource use on society and the environment, and suggest options for conserving energy and resources

Specific expectations

By the end of Grade 5, students will:

Conservation of Energy and Resources

E1.1 analyse long-term impacts of human uses of energy and natural resources, on society and the environment, including climate change, and suggest ways to mitigate these impacts

E1.2 evaluate effects of various technologies on energy consumption, and describe ways in which individuals can use technology to reduce energy consumption

E1.3 analyse how First Nations, Métis, and Inuit communities use their knowledges and ways of knowing to conserve energy and resources

E2. Exploring and Understanding Concepts

demonstrate an understanding of the conservation of energy, and the forms, sources, and uses of energy and resources

Specific expectations

By the end of Grade 5, students will:

Conservation of Energy and Resources

E2.1 identify a variety of forms of energy, and describe how each form is used in everyday life

E2.2 demonstrate an understanding of the law of conservation of energy, including how energy cannot be created or destroyed but can only be transformed from one form to another

E2.3 describe how energy is stored as potential energy and transformed in a given device or system

E2.4 demonstrate an understanding that when energy is transformed from one form to another, some energy may dissipate into the environment in the form of heat, light, and/or sound energy

E2.5 identify renewable and non-renewable sources of energy

E2.6 explain how the use of energy derived from fossil fuels changes the composition of the atmosphere and how these changes contribute to climate change

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Science and Technology, Grade 6

Expectations by strand

A. STEM Skills and Connections

This strand focuses on science, technology, engineering, and mathematics (STEM) skills, coding and emerging technologies, practical applications of science and technology, and contributions that people with diverse lived experiences have made to science and technology. In all grades of the science and technology program, the learning related to this strand takes place in the context of learning related to the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, and it should be assessed and evaluated within these contexts.

Overall expectations

Throughout Grade 6, in connection with the learning in the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, students will:

A1. STEM Investigation and Communication Skills

use a scientific research process, a scientific experimentation process, and an engineering design process to conduct investigations, following appropriate health and safety procedures

Specific expectations

Throughout Grade 6, in connection with the learning in the other strands, students will:

A1.1 use a scientific research process and associated skills to conduct investigations

A1.2 use a scientific experimentation process and associated skills to conduct investigations

A1.3 use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems

A1.4 follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials

A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes

A2. Coding and Emerging Technologies

use coding in investigations and to model concepts, and assess the impact of coding and of emerging technologies on everyday life and in STEM-related fields

Specific expectations

Throughout Grade 6, in connection with the learning in the other strands, students will:

A2.1 write and execute code in investigations and when modelling concepts, with a focus on obtaining input in different ways for a variety of purposes

A2.2 identify and describe impacts of coding and of emerging technologies on everyday life, including skilled trades

A3. Applications, Connections, and Contributions

demonstrate an understanding of the practical applications of science and technology, and of contributions to science and technology from people with diverse lived experiences

Specific expectations

Throughout Grade 6, in connection with the learning in the other strands, students will:

A3.1 describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems

A3.2 investigate how science and technology can be used with other subject areas to address real-world problems

A3.3 analyse contributions to science and technology from various communities

B. Life Systems

Biodiversity

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 6, students will:

B1. Relating Science and Technology to Our Changing World

assess the importance of biodiversity, and describe ways of protecting biodiversity

Specific expectations

By the end of Grade 6, students will:

Biodiversity

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

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

B2. Exploring and Understanding Concepts

demonstrate an understanding of biodiversity, its contributions to the stability of natural systems, and its benefits to humans

Specific expectations

By the end of Grade 6, students will:

Biodiversity

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

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

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

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

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

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

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

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

C. Matter and Energy

Electrical Phenomena, Energy, and Devices

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 6, students will:

C1. Relating Science and Technology to Our Changing World

evaluate the impact of the use and generation of electrical energy on society and the environment, and suggest ways to use electrical energy responsibly

Specific expectations

By the end of Grade 6, students will:

Electrical Phenomena, Energy, and Devices

C1.1 assess the short- and long-term impacts of electrical energy generation technologies in Canada on society and the environment, including impacts on First Nations, Métis, and Inuit communities, and on climate change

C1.2 assess choices that reduce personal use of electrical energy from both renewable and non-renewable sources, and advocate for the responsible use of electrical energy by the school community

C2. Exploring and Understanding Concepts

demonstrate an understanding of the principles of electrical energy and its transformation into and from other forms of energy

Specific expectations

By the end of Grade 6, students will:

Electrical Phenomena, Energy, and Devices

C2.1 explain commonly observed electrostatic phenomena, using the principles of static electricity

C2.2 describe current electricity, and compare and contrast current electricity with static electricity

C2.3 identify materials that are good conductors of electric current and materials that are good insulators

C2.4 describe how technologies transform various forms of energy into electrical energy

C2.5 describe ways in which electrical energy is transformed into other forms of energy

C2.6 explain the functions of the components of a simple electrical circuit

C2.7 distinguish between series and parallel circuits, and identify common uses of each type of circuit

D. Structures and Mechanisms

Flight

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 6, students will:

D1. Relating Science and Technology to Our Changing World

assess the environmental impacts of flying machines

Specific expectations

By the end of Grade 6, students will:

Flight

D1.1 assess the impacts on society of aviation technologies, while considering both local and global perspectives

D2. Exploring and Understanding Concepts

demonstrate an understanding of the ways in which properties of air can be applied to the principles of flight and flying machines

Specific expectations

By the end of Grade 6, students will:

Flight

D2.1 identify flight-related applications of the properties of air

D2.2 describe the relationships between the four forces of flight – lift, weight, thrust, and drag – that make flight possible

D2.3 describe ways in which flying machines and various organisms use balanced and unbalanced forces to control their flight

D2.4 describe ways in which the four forces of flight can be altered

D2.5 describe characteristics and adaptations that enable organisms to fly

E. Earth and Space Systems

Space

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 6, students will:

E1. Relating Science and Technology to Our Changing World

assess the impact of space exploration on humans, society, and the environment

Specific expectations

By the end of Grade 6, students will:

Space

E1.1 analyse the impact that conditions in space have on humans engaged in space exploration, and explain how humans meet their social, emotional, and physiological needs in space

E1.2 assess the role of space exploration technology in observing and understanding environmental changes on Earth, including climate change

E1.3 evaluate the social and environmental impacts of space exploration, while taking various perspectives into consideration

E2. Exploring and Understanding Concepts

demonstrate an understanding of the solar system, the phenomena that result from the movement of different bodies within it, and the technologies used in space exploration

Specific expectations

By the end of Grade 6, students will:

Space

E2.1 identify components of the solar system, including the Sun, Earth and other planets, natural satellites, comets, asteroids, and meteoroids, and describe their main physical characteristics

E2.2 distinguish between the concepts of *mass* and *weight*

E2.3 describe the relationship between the force of gravity and the weight of a body

E2.4 identify the types of bodies in space that emit light and those that reflect light

E2.5 describe various effects of the relative positions and motions of Earth, the Moon, and the Sun

E2.6 identify various technologies used in space exploration, and describe how technological innovations have contributed to our understanding of space

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Science and Technology, Grade 7

Expectations by strand

A. STEM Skills and Connections

This strand focuses on science, technology, engineering, and mathematics (STEM) skills, coding and emerging technologies, practical applications of science and technology, and contributions that people with diverse lived experiences have made to science and technology. In all grades of the science and technology program, the learning related to this strand takes place in the context of learning related to the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, and it should be assessed and evaluated within these contexts.

Overall expectations

Throughout Grade 7, in connection with the learning in the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, students will:

A1. STEM Investigation and Communication Skills

use a scientific research process, a scientific experimentation process, and an engineering design process to conduct investigations, following appropriate health and safety procedures

Specific expectations

Throughout Grade 7, in connection with the learning in the other strands, students will:

A1.1 use a scientific research process and associated skills to conduct investigations

A1.2 use a scientific experimentation process and associated skills to conduct investigations

A1.3 use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems

A1.4 follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials

A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes

A2. Coding and Emerging Technologies

use coding in investigations and to model concepts, and assess the impact of coding and of emerging technologies on everyday life and in STEM-related fields

Specific expectations

Throughout Grade 7, in connection with the learning in the other strands, students will:

A2.1 write and execute code in investigations and when modelling concepts, with a focus on planning and designing programs

A2.2 identify and describe impacts of coding and of emerging technologies, such as artificial intelligence systems, on everyday life, including skilled trades

A3. Applications, Connections, and Contributions

demonstrate an understanding of the practical applications of science and technology, and of contributions to science and technology from people with diverse lived experiences

Specific expectations

Throughout Grade 7, in connection with the learning in the other strands, students will:

A3.1 describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems

A3.2 investigate how science and technology can be used with other subject areas to address real-world problems

A3.3 analyse contributions to science and technology from various communities

B. Life Systems

Interactions in the Environment

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 7, students will:

B1. Relating Science and Technology to Our Changing World

assess the impact of human activities and technologies on the environment, and analyse ways to mitigate negative impacts and contribute to environmental sustainability

Specific expectations

By the end of Grade 7, students will:

Interactions in the Environment

B1.1 assess the impact of various technologies on the environment

B1.2 assess the effectiveness of various ways of mitigating the negative and enhancing the positive impact of human activities on the environment

B1.3 analyse how diverse First Nations, Métis, and Inuit practices and perspectives contribute to environmental sustainability

B2. Exploring and Understanding Concepts

demonstrate an understanding of interactions between and among biotic and abiotic components in the environment

Specific expectations

By the end of Grade 7, students will:

Interactions in the Environment

B2.1 explain that an ecosystem is a network of interactions among living organisms and their environment

B2.2 identify biotic and abiotic components in an ecosystem, and describe the interactions between them

B2.3 describe roles and relationships between producers, consumers, and decomposers within an ecosystem

B2.4 describe the transfer of energy in a food chain, and explain the effects of altering any part of the chain

B2.5 describe how matter is cycled within the environment, and explain how the cycling of matter promotes sustainability

B2.6 explain the differences between primary succession and secondary succession in ecosystems

B2.7 explain how biotic and abiotic factors limit the number of organisms an ecosystem can sustain

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

C. Matter and Energy

Pure Substances and Mixtures

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 7, students will:

C1. Relating Science and Technology to Our Changing World

evaluate the environmental and social impacts of the use and disposal of various pure substances and mixtures

Specific expectations

By the end of Grade 7, students will:

Pure Substances and Mixtures

C1.1 analyse the social and environment impacts of the use and disposal of pure substances found in technological devices, considering local and global perspectives

C1.2 assess environmental and social impacts of different industrial methods used to separate mixtures

C2. Exploring and Understanding Concepts

demonstrate an understanding of the nature of matter, including the properties of pure substances and mixtures, and describe these properties using particle theory

Specific expectations

By the end of Grade 7, students will:

Pure Substances and Mixtures

C2.1 demonstrate an understanding of the particle theory of matter

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

C2.3 distinguish between homogeneous and heterogeneous mixtures

C2.4 use the particle theory to describe how different factors affect the solubility of a substance and the rate at which it dissolves

C2.5 describe the concentration of a saturated solution in both qualitative and quantitative terms, and differentiate between saturated and unsaturated solutions

C2.6 explain why water is referred to as the universal solvent

C2.7 explain various processes used to separate mixtures, including solutions, into their components, and identify some applications of these processes

C2.8 describe pure substances as elements and compounds consisting of atoms and combinations of atoms

D. Structures and Mechanisms

Form, Function, and Design of Structures

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 7, students will:

D1. Relating Science and Technology to Our Changing World

analyse personal, social, economic, and environmental factors that should be considered when designing and building structures

Specific expectations

By the end of Grade 7, students will:

Form, Function, and Design of Structures

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

D1.2 evaluate the impact of the ergonomic design of various tools, objects, and work spaces on a user's health, safety, and ability to work efficiently, and use this information to describe changes that could be made in their own spaces and activities

D2. Exploring and Understanding Concepts

demonstrate an understanding of the relationship between structural forms and the forces acting on them

Specific expectations

By the end of Grade 7, students will:

Form, Function, and Design of Structures

D2.1 classify structures as solid structures, frame structures, or shell structures

D2.2 describe ways in which the centre of gravity of a structure affects the structure's stability

D2.3 identify the magnitude, direction, point of application, and plane of application of the forces applied to a structure

D2.4 describe the role of symmetry in structures, and identify instances of symmetry in various structures

D2.5 describe factors that can cause a structure to fail

D2.6 identify the factors that determine the suitability of materials for use in manufacturing a product or constructing a structure

D2.7 describe methods engineers and other professionals use to assess, improve, and maintain the safety of structures

E. Earth and Space Systems

Heat in the Environment

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 7, students will:

E1. Relating Science and Technology to Our Changing World

assess the benefits of technologies that reduce heat loss, and analyse various social and environmental impacts of the use of energy from renewable and non-renewable sources

Specific expectations

By the end of Grade 7, students will:

Heat in the Environment

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

E1.2 analyse various social, economic, and environmental impacts, including impacts related to climate change, of using non-renewable and renewable sources of energy

E2. Exploring and Understanding Concepts

demonstrate an understanding of heat as a form of energy that is associated with the movement of particles and is essential for many natural processes within Earth's systems

Specific expectations

By the end of Grade 7, students will:

Heat in the Environment

E2.1 use particle theory to explain how heat affects the motion of particles in a solid, a liquid, and a gas

E2.2 demonstrate an understanding of various ways in which heat is generated

E2.3 use particle theory to explain the effects of heat on volume in solids, liquids, and gases, including during changes of states of matter

E2.4 explain how heat is transmitted through conduction, and describe natural processes that are affected by conduction

E2.5 explain how heat is transmitted in liquids and gases through convection, and describe natural processes that depend on convection

E2.6 explain how heat is transmitted through radiation, and describe the effects of radiation from the Sun on different kinds of surfaces

E2.7 describe the role of radiation in heating and cooling Earth, and explain how greenhouse gases affect the transmission of radiated heat through the atmosphere

E2.8 identify common sources of greenhouse gases, including sources resulting from human activity, and describe how humans can reduce emissions of these gases

Information for parents

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Science and Technology, Grade 8

Expectations by strand

A. STEM Skills and Connections

This strand focuses on science, technology, engineering, and mathematics (STEM) skills, coding and emerging technologies, practical applications of science and technology, and contributions that people with diverse lived experiences have made to science and technology. In all grades of the science and technology program, the learning related to this strand takes place in the context of learning related to the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, and it should be assessed and evaluated within these contexts.

Overall expectations

Throughout Grade 8, in connection with the learning in the Life Systems, Matter and Energy, Structures and Mechanisms, and Earth and Space Systems strands, students will:

A1. STEM Investigation and Communication Skills

use a scientific research process, a scientific experimentation process, and an engineering design process to conduct investigations, following appropriate health and safety procedures

Specific expectations

Throughout Grade 8, in connection with the learning in the other strands, students will:

A1.1 use a scientific research process and associated skills to conduct investigations

A1.2 use a scientific experimentation process and associated skills to conduct investigations

A1.3 use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems

A1.4 follow established health and safety procedures during science and technology investigations, including wearing appropriate protective equipment and clothing and safely using tools, instruments, and materials

A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes

A2. Coding and Emerging Technologies

use coding in investigations and to model concepts, and assess the impact of coding and of emerging technologies on everyday life and in STEM-related fields

Specific expectations

Throughout Grade 8, in connection with the learning in the other strands, students will:

A2.1 write and execute code in investigations and when modelling concepts, with a focus on automating large systems in action

A2.2 identify and describe impacts of coding and of emerging technologies, such as artificial intelligence systems, on everyday life, including skilled trades

A3. Applications, Connections, and Contributions

demonstrate an understanding of the practical applications of science and technology, and of contributions to science and technology from people with diverse lived experiences

Specific expectations

Throughout Grade 8, in connection with the learning in the other strands, students will:

A3.1 describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems

A3.2 investigate how science and technology can be used with other subject areas to address real-world problems

A3.3 analyse contributions to science and technology from various communities

B. Life Systems

Cells

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 8, students will:

B1. Relating Science and Technology to Our Changing World

assess developments in cell biology and their impact on individuals, society, and the environment

Specific expectations

By the end of Grade 8, students will:

Cells

B1.1 assess how various technologies have enhanced our understanding of cells and cellular processes

B1.2 analyse beneficial and harmful effects of developments in cell biology and associated emerging technologies on human health and the environment, while taking different perspectives into consideration

B2. Exploring and Understanding Concepts

demonstrate an understanding of the basic structure and function of plant and animal cells and cell processes

Specific expectations

By the end of Grade 8, students will:

Cells

B2.1 demonstrate an understanding of cells, using cell theory

B2.2 identify organelles and other cell components, including the nucleus, cell membrane, cell wall, chloroplasts, vacuole, mitochondria, and cytoplasm, and explain their basic functions

B2.3 compare the structure and function of plant and animal cells

B2.4 explain the processes of diffusion and osmosis within a cell

B2.5 describe various unicellular and multicellular organisms, and compare ways in which these two types of organisms meet their basic needs

B2.6 describe the organization of cells into tissues, organs, and systems

C. Matter and Energy

Fluids

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 8, students will:

C1. Relating Science and Technology to Our Changing World

analyse uses of various technologies that rely on the properties of fluids, and assess the impact of these technologies on society and the environment

Specific expectations

By the end of Grade 8, students will:

Fluids

C1.1 assess the environmental, social, and economic impacts of various innovations and technologies that are based on the properties of fluids

C1.2 assess the environmental and social impacts of fluid spills, including impacts on First Nations, Métis, and Inuit communities, and including the cost and technical challenges related to cleanup and remediation efforts

C2. Exploring and Understanding Concepts

demonstrate an understanding of basic fluid mechanics, including the properties and uses of fluids

Specific expectations

By the end of Grade 8, students will:

Fluids

C2.1 demonstrate an understanding of the factors that affect viscosity, and compare the viscosity of various fluids, including volumetric flow rate

C2.2 demonstrate an understanding of the relationship between mass, volume, and density

C2.3 explain the difference between solids, liquids, and gases in terms of their density, using the particle theory of matter

C2.4 explain the difference between liquids and gases in terms of their compressibility and how their compressibility affects their technological applications

C2.5 determine the buoyancy of an object, given its density, in a variety of fluids

C2.6 explain in qualitative terms the relationship between pressure, volume, and temperature when a liquid or a gas is compressed or heated

C2.7 describe how forces are transferred in all directions in fluids, including using Pascal's law to quantify the transfer of forces in fluids

C2.8 describe factors that affect the flow of fluids

C2.9 describe the differences between pneumatic and hydraulic systems

C2.10 compare how fluids are used and how their flow is regulated in living organisms and in mechanical devices or systems

D. Structures and Mechanisms

Systems in Action

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 8, students will:

D1. Relating Science and Technology to Our Changing World

assess the social and environmental impacts of various systems, and evaluate improvements to the systems or alternative ways of meeting the same needs

Specific expectations

By the end of Grade 8, students will:

Systems in Action

D1.1 assess the social, economic, and environmental impacts of automating systems

D1.2 assess the impact on individuals, society, and the environment of alternative ways of meeting needs that are currently met by existing systems, taking different points of view into consideration

D2. Exploring and Understanding Concepts

demonstrate an understanding of different types of systems and the factors that contribute to their safe and efficient operation

Specific expectations

By the end of Grade 8, students will:

Systems in Action

D2.1 identify various types of systems

D2.2 describe the purpose, inputs, and outputs of various systems, including systems related to food processing

D2.3 identify the various processes and components of a system that allow it to perform its function efficiently and safely

D2.4 use the scientific terms *displacement*, *force*, *work*, *energy*, and *efficiency* to describe everyday experiences

D2.5 demonstrate an understanding of the relationships between work, force, and displacement in simple systems

D2.6 explain the relationship between input and output forces and determine the mechanical advantage of various mechanical systems, including simple machines

D2.7 identify ways in which energy can dissipate from mechanical systems, and describe technological innovations that make these systems more efficient

D2.8 explain how providing information and support to consumers helps to ensure that the systems they use run safely and efficiently

D2.9 describe technological innovations involving mechanical systems that have increased productivity in various industries

D2.10 identify social factors that influence the evolution of a system

E. Earth and Space Systems

Water Systems

In this strand, students integrate learning from Strand A as they investigate concepts, develop and apply skills, and make meaningful connections to their lives and communities.

Overall expectations

By the end of Grade 8, students will:

E1. Relating Science and Technology to Our Changing World

assess the impact of human activities and technologies on the sustainability of water resources

Specific expectations

By the end of Grade 8, students will:

Water Systems

E1.1 assess the social and environmental impact of the scarcity of fresh water, and propose a plan of action to help address fresh water sustainability issues

E1.2 demonstrate an understanding of First Nations, Métis, and Inuit knowledges and values about water, connections to water, and ways of managing water resources sustainably

E1.3 assess the impact of scientific discoveries and technological innovations on local and global water systems

E2. Exploring and Understanding Concepts

demonstrate an understanding of the characteristics of Earth's water systems and of factors that affect these systems

Specific expectations

By the end of Grade 8, students will:

Water Systems

E2.1 identify the states of water on Earth's surface, their distribution, relative amounts, and circulation, and the conditions under which they exist

E2.2 demonstrate an understanding of a watershed, and explain its importance to water management and planning

E2.3 explain how human activity and natural phenomena cause changes in the water table

E2.4 identify factors, including climate change, that have contributed to the melting of glaciers and polar ice-caps, and describe the effects of this phenomenon on local and global water systems

E2.5 explain changes in atmospheric conditions caused by the presence of bodies of water

E2.6 describe various indicators of water quality, and explain the impact of human activity on those indicators

E2.7 explain how municipalities process water and manage water usage

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