

A Correlation of the Ontario Curriculum, Grades 1-8: Science and Technology, 1998 and the Science and Technology for Children™ Curriculum

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The following tables are provided to give a quick visual guide to the correlation of the Ontario Curriculum with the *Science and Technology for Children™* (STC™) units of study. Since there is some flexibility in grade-level placement with the STC™ units, we suggest that you give consideration to units recommended for the grade level above and the grade level below the grade being considered. For example, in selecting units for grade four, consider also the units listed for grades three and five.

Key to Abbreviations of STC™ Units

O	Organisms	PGD	Plant Growth and Development	Mw	Microworlds
W	Weather	RM	Rocks and Minerals	E	Ecosystems
SL	Solids and Liquids	CT	Chemical Tests	FC	Food Chemistry
CM	Comparing and Measuring	So	Sound	FS	Floating and Sinking
LCB	The Life Cycle of Butterflies	AS	Animal Studies	EP	Experiments with Plants
S	Soils	LW	Land and Water	MT	Measuring Time
C	Changes	MD	Motion and Design	TP	The Technology of Paper
BW	Balancing and Weighing	EC	Electric Circuits	MM	Magnets and Motors

Recommended Grade Levels for STC™ Units

The National Science Resources Center (NSRC) recommends that an STC™ unit not be moved up or down more than one grade level from these recommendations. In the following correlation, an STC unit that meets a standard, but falls outside the recommended grade range, is indicated by an accompanying *.

1st				2nd				3rd			
O	W	SL	CM	LCB	S	C	BW	PGD	RM	CT	So
4th				5th				6th			
AS	LW	MD	EC	Mw	E	FC	FS	EP	MT	TP	MM

Life Systems: Grade 1 – Characteristics and Needs of Living Things

Overall Expectations

By the end of Grade 1, students will:

- demonstrate an understanding of the basic needs of animals and plants (e.g., the need for food, air, and water); O, LCB
- investigate the characteristics and needs of animals and plants; O
- demonstrate awareness that animals and plants depend on their environment to meet their basic needs, and describe the requirements for good health for humans. O

Specific Expectations

Understanding Basic Concepts

By the end of Grade 1, students will:

- identify major parts of the human body and describe their functions (e.g., arms and legs for movement; lungs and nose for breathing); O
- identify the location and function of each sense organ;
- classify characteristics of animals and plants by using the senses (e.g., texture, colour, size, sounds); O
- describe the different ways in which animals move (e.g., moles burrow with their large, strong front limbs; fish undulate their bodies) to meet their needs; O, LCB
- identify and describe common characteristics of humans and other animals that they have observed, and identify variations in these characteristics (e.g., eye and hair colour); O
- describe some basic changes in humans as they grow (e.g., growth of feet, hands, arms; loss of baby teeth), and compare changes in humans with changes in other living things; LCB
- describe patterns that they have observed in living things (e.g., sunflower, pine cone, turtle's shell). O

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 1, students will:

- select and use appropriate tools to increase their capacity to observe (e.g., magnifying glass, stethoscope); All STC units
- ask questions about and identify some needs of living things, and explore possible answers to these questions and ways of meeting these needs (e.g., predict how an animal will move on the basis of two or more characteristics that they have observed); O
- plan investigations to answer some of these questions or find ways of meeting these needs; O
- use appropriate vocabulary in describing their investigations, explorations, and observations (e.g., use body, legs, wings, and feelers in describing an insect); O, LCB
- record relevant observations, findings, and measurements, using written language, drawings, charts, and concrete materials (e.g., make a drawing of an insect, observing with the unaided eye, and a drawing of the same insect while using a magnifying glass); O, LCB

- communicate the procedures and results of investigations for specific purposes, using demonstrations, drawings, and oral and written descriptions (e.g., demonstrate how a bird builds a nest). O

Relating Science and Technology to the World Outside the School

By the end of Grade 1, students will:

- compare the basic needs of humans with the needs of other living things (e.g., the need for food, air, water, light); O
- compare ways in which humans and other animals use their senses to meet their needs (e.g., use of the senses of sight and smell in finding food); LCB
- describe ways in which people adapt to the loss or limitation of sensory or physical ability (e.g., blind people develop more acute hearing; people who cannot walk may use a wheel chair);
- identify a familiar animal or plant from seeing only a part of it (e.g., a feather of a bird, a leaf of a tree); O
- describe ways in which the senses can both protect and mislead (e.g., seeing enables us to avoid walking into an obstacle; the sense of smell is not reliable when we have a cold);
- describe a balanced diet using the four basic food groups outlined in Canada's Food Guide to Healthy Eating, and demonstrate awareness of the natural sources of items in the food groups (e.g., bread is made from plant products; meat and milk come from animals); FC*
- identify ways in which individuals can maintain a healthy environment for themselves and for other living things (e.g., practice cleanliness to reduce the spreading of germs; ensure that materials such as toy balloons are not left outdoors since they are harmful to birds if they are ingested).

Life Systems: Grade 2 – Growth and Changes in Animals

Overall Expectations

By the end of Grade 2, students will:

- demonstrate an understanding of the similarities and differences among various types of animals and the ways in which animals adapt to different environmental conditions; O, LCB
- investigate physical and behavioural characteristics and the process of growth of different types of animals; O, LCB
- identify ways in which humans can affect other animals. O, LCB

Specific Expectations

Understanding Basic Concepts

By the end of Grade 2, students will:

- identify and describe the major physical characteristics of different types of animals (e.g., mammals, reptiles, insects); O, LCB
- identify and describe behavioural characteristics that enable animals to survive (e.g., migration, dormancy, hibernation); LCB, AS*
- classify a variety of animals using observable characteristics (e.g., size, body covering, teeth); O, LCB

- compare ways in which animals eat their food (e.g., tear flesh, crack shells), move, and use their environment to meet their needs (e.g., gather grass and twigs to build nests); O, LCB
- describe changes in the appearance and activity of an animal as it goes through a complete life cycle (e.g., mealworm); LCB
- compare the life cycles of some animals that have similar life cycles (e.g., bee and butterfly) and some that have different life cycles (e.g., gerbil and butterfly); LCB
- identify constant traits (e.g., number of legs) and changing traits (e.g., weight) in animals as they grow, and compare the appearance of young and mature animals of the same species; LCB
- describe ways in which animals respond and adapt to their environment (e.g., weasels change colour for camouflage in summer and winter; mammals living in colder climates have longer fur); LCB
- compare ways in which different animals care for their young (e.g., bears, alligators, sea turtles).

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 2, students will:

- ask questions about and identify some needs of different animals with which they are familiar, and explore possible answers to these questions and ways of meeting these needs (e.g., examine different kinds of teeth and explain how their shape enables an animal to bite, tear, or grind its food); O, LCB, AS*
- plan investigations to answer some of these questions or find ways of meeting these needs, and describe the steps involved; O, LCB, AS*
- use appropriate vocabulary in describing their investigations, explorations, and observations (e.g., use the words egg, caterpillar, larva, chrysalis, and adult in describing the metamorphosis of a butterfly); O, LCB, AS*
- record relevant observations, findings, and measurements, using written language, drawings, and concrete materials (e.g., make accurately labelled drawings showing the life cycle of an animal); O, LCB, AS*
- communicate the procedures and results of investigations for specific purposes, using drawings, demonstrations, and oral and written descriptions (e.g., explain how a caterpillar feeds, using a model constructed of modeling clay and a tree branch). O, LCB, AS*

Relating Science and Technology to the World Outside the School

By the end of Grade 2, students will:

- describe features of the environment that support the growth of familiar animals (e.g., water and insects in a frog's environment); O
- identify and compare the effects of the seasons on animals (e.g., some animals grow a thicker coat in cold weather); W
- describe ways in which humans can help or harm other living things (e.g., protecting endangered species); O
- demonstrate an understanding of the requirements of small animals for survival (e.g., by maintaining an aquarium or a terrarium); O, LCB
- describe the life processes of an animal that they have observed (e.g., the eating habits, movement, rest patterns, and breathing of a mealworm); O, LCB

- demonstrate awareness of ways of caring for animals properly (e.g., avoid handling them too much; research nutritional requirements); O, LCB
- describe how humans produce food by raising livestock (e.g., pigs, chickens, cattle).

Life Systems: Grade 3 – Growth and Changes in Plants

Overall Expectations

By the end of Grade 3, students will:

- demonstrate an understanding of the similarities and differences in the physical characteristics of different plant species and the changes that take place in different plants as they grow; PGD
- investigate the requirements of plants and the effects of changes in environmental conditions on plants; PGD
- describe ways in which plants are important to other living things, and the effects of human activities on plants. PGD, E*

Specific Expectations

Understanding Basic Concepts

By the end of Grade 3, students will:

- identify the major parts of plants (e.g., seeds, stem, pistil) and describe their basic functions; PGD
- classify plants according to visible characteristics (e.g., type of tree bark, leaf shape, type of flowers); O*
- describe, using their observations, the changes that plants undergo in a complete life cycle (e.g., from the germination of a seed to the production of flowers or fruit); PGD
- describe, using their observations, the effects of the seasons on plants (e.g., leaf buds grow into leaves in the spring; leaves turn colour in the fall);
- compare the life cycles of different kinds of plants (e.g., plants that grow from bulbs or from seeds); PGD
- identify traits that remain constant in some plants as they grow (e.g., leaf shape, leaf size, flower colour); PGD
- describe, using their observations, how the growth of plants is affected by changes in environmental conditions (e.g., changes in light, soil); PGD, EP*
- explain how different features of plants help them survive (e.g., leaf structure, fibrous or tap root systems). PGD

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 3, students will:

- design and conduct a hands-on inquiry into seed germination or plant growth; PGD, EP*
- ask questions about and identify some needs of plants, and explore possible answers to these questions and ways of meeting these needs (e.g., predict how long a particular plant could go without water before its leaves started to droop); PGD
- plan investigations to answer some of these questions or find ways of meeting these needs, and explain the steps involved; PGD, EP*

- use appropriate vocabulary in describing their investigations, explorations, and observations (e.g., stem, pistil, stamen, flower); PGD, EP*
- record relevant observations, findings, and measurements, using written language, drawings, charts, and graphs (e.g., produce a series of drawings to show a plant at different stages of development); PGD, EP*
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using drawings, demonstrations, simple media works, and oral and written descriptions (e.g., make a graph that shows the number and kinds of trees found in different yards; design and construct a terrarium or garden that reproduces the conditions that they found to be requirements of specific plants PGD, EP*

Relating Science and Technology to the World Outside the School

By the end of Grade 3, students will:

- describe ways in which humans use plants for food, shelter, and clothing (e.g., trees are used for building houses; cloth is made from cotton); PGD
- describe ways in which humans can protect natural areas to maintain native plant species (e.g., establishing conservation areas, wildlife reserves, wetland sanctuaries); E*
- identify the parts of a plant that are used to produce specific products for humans (e.g., sugar, dyes, paper, cloth, lumber) and describe the steps in production; PGD
- describe various plants used in food preparation (e.g., vegetables, fruits, spices, herbs) and identify places where they can be grown; PGD
- describe various settings in which plant crops are grown (e.g., farms, orchards, home gardens); PGD
- describe ways in which plants and animals depend on each other (e.g., plants provide food for energy, and animals help distribute pollen and seeds); PGD
- compare the requirements of some plants and animals, and identify the requirements that are common to all living things (e.g., the need for water and minerals); O*, PGD
- demonstrate awareness of ways of caring for plants properly (e.g., ensure that a plant has sufficient light and water); PGD
- identify some functions of different plants in their local area (e.g., trees provide shade; grass binds soil to prevent soil erosion). LW*

Life Systems: Grade 4 – Habitats and Communities

Overall Expectations

By the end of Grade 4, students will:

- demonstrate an understanding of the concepts of habitat and community, and identify the factors that could affect habitats and communities of plants and animals; AS, E
- investigate the dependency of plants and animals on their habitat and the interrelationships of the plants and animals living in a specific habitat; AS, E
- describe ways in which humans can change habitats and the effects of these changes on the plants and animals within the habitats. E

Specific Expectations

Understanding Basic Concepts

By the end of Grade 4, students will:

- identify, through observation, various factors that affect plants and animals in a specific habitat (e.g., availability of water, food sources, light; ground features; weather conditions); AS, E
- classify organisms according to their role in a food chain (e.g., producer, consumer); AS, E
- demonstrate an understanding of a food chain as a system in which energy from the sun is transferred eventually to animals, construct food chains of different plant and animal species (e.g., carrot→rabbit→fox), and classify animals as omnivore, carnivore, and herbivore; AS, E
- describe structural adaptations of plants and animals that demonstrate a response of the living things to their environment (e.g., the height of a plant depends on the amount of sunlight the plant gets; many animals that live in the Arctic have white fur); AS
- recognize that animals and plants live in specific habitats because they are dependent on those habitats and have adapted to them (e.g., ducks live in marshes because they need marsh plants for food and shelter and water for movement); AS
- classify plants and animals that they have observed in local habitats according to similarities and differences (e.g., in shape, location). O*, AS

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 4, students will:

- formulate questions about and identify the needs of animals and plants in a particular habitat, and explore possible answers to these questions and ways of meeting these needs (e.g., predict the structural adaptations, such as webbed feet, that help aquatic animals live in water); AS
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; AS
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations, explorations, and observations (e.g., habitat, population, ecological niche, community, food chain); AS, E
- compile data gathered through investigation in order to record and present results, using tally charts, tables, and labelled graphs produced by hand or with a computer (e.g., display data gathered in a population-simulation exercise, using a labelled graph; classify species of insects in the neighbourhood according to habitat, using a chart or table); AS, E
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, drawings, and charts (e.g., prepare a poster illustrating the components of a local habitat; trace a food chain in an illustrated chart, using the sun as the starting point). AS, E

Relating Science and Technology to the World Outside the School

By the end of Grade 4, students will:

- describe ways in which humans are dependent on plants and animals (e.g., for food products, medicine, clothing, lumber);
- describe ways in which humans can affect the natural world (e.g., urban development forces some species to go elsewhere and enables other species to multiply too rapidly; conservation areas can be established to protect specific habitats);

- construct food chains that include different plant and animal species and humans (e.g., grass→cattle→humans);
- show the effects on plants and animals of the loss of their natural habitat (e.g., nesting sites of ducks may be destroyed when a dam is built);
- investigate ways in which the extinction of a plant or animal species affects the rest of the natural community and humans (e.g., chart the distribution of wolves on a world map and predict the effects if wolves were to become extinct; use a software program that simulates a specific environment to track the effects of the loss of a plant species).

Life Systems: Grade 5 – Human Organ Systems

By the end of Grade 5, students will:

- demonstrate an understanding of the structure and function of the respiratory, circulatory, digestive, excretory, and nervous systems, and the interactions of organs within each system;
- investigate the structure and function of the major organs of the respiratory, circulatory, digestive, excretory, and nervous systems;
- demonstrate understanding of factors that contribute to good health. FC (in part)

Specific Expectations

Understanding Basic Concepts

By the end of Grade 5, students will:

- identify the cell as the basic unit of life; Mw
- describe the basic structure and function of the major organs in the respiratory, circulatory, digestive, excretory, and nervous systems;
- describe, using models and simulations, ways in which the skeletal, muscular, and nervous systems work together to produce movement (e.g., make a model of the structure of the bones and muscles in an arm, using cardboard rolls and elastic bands);
- identify the skin as an organ and explain its purpose;
- explain what happens to excess nutrients not immediately used by the body; FC
- describe the components of the body's system of defense against infections (e.g., tears, skin, white blood cells).

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 5, students will:

- formulate questions about and identify the needs of humans, and explore possible answers to these questions and ways of meeting these needs (e.g., in studying the nervous system, investigate response times by having someone catch a ruler between the thumb and index finger after it is dropped by another person; investigate ways in which orthopaedic devices, such as back rests, have improved the quality of life);
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions;
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations, explorations, and observations (e.g., use terms such as teeth, esophagus, stomach, and gastric juices in describing the digestive system);

- compile data gathered through investigation in order to record and present results, using tally charts, tables, and labelled graphs produced by hand or with a computer (e.g., record both qualitative and quantitative data from observations of the nutritional value of foods; produce a graph of the heartbeat rate of someone climbing a specific number of stairs in a given length of time); FC
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, drawings, and charts (e.g., create a comparison chart, grouping foods by major nutrients and by their categories in Canada's Food Guide to Healthy Eating). FC

Relating Science and Technology to the World Outside the School

By the end of Grade 5, students will:

- describe the types of nutrients in foods (e.g., carbohydrates, fats, proteins, vitamins, minerals) and their function in maintaining a healthy body (e.g., supporting growth); FC
- identify a balanced diet as one containing carbohydrates, proteins, fats, minerals, vitamins, fibre, and water, and design a diet that contains all of these; FC
- identify food sources from which people in various societies obtain nutrients (e.g., rice, potatoes, and grains furnish carbohydrates); FC
- interpret nutritional information to make healthy food choices (e.g., sort commercial cereals into different categories, such as high fat, low fat, high salt, low sugar, and decide which are best); FC
- demonstrate awareness that some disorders can be affected by diet (e.g., diabetes, heart disease); FC
- identify types of industries involved in the processing and preserving of foods; FC
- describe the relationship between eating habits, weight, height, and metabolism; FC
- describe ways in which various kinds of organisms (e.g., bacteria, fungi) are used to recycle human waste;
- explain the importance of daily physical activity;
- explain how the health of human beings is affected by environmental factors (e.g., smoking, smog, and pollen affect the respiratory system);
- explain the benefits and disadvantages of using some technological innovations (e.g., headsets designed to protect ears from excessive noise are helpful, but headphones used to listen to music can cause hearing impairment);
- describe some types of medical technology (e.g., exercise machines, hearing aids, prosthetics).

Life Systems: Grade 6 – Diversity of Living Things

Overall Expectations

By the end of Grade 6, students will:

- demonstrate an understanding of ways in which classification systems are used to understand the diversity of living things and the interrelationships among living things;
- investigate classification systems and some of the processes of life common to all animals (e.g., growth, reproduction, movement, response, and adaptation); PGD*, AS*, E, EP
- describe ways in which classification systems can be used in everyday life.

Specific Expectations

Understanding Basic Concepts

By the end of Grade 6, students will:

- explain why formal classification systems are usually based on structural characteristics (e.g., type of skeleton, circulatory system, reproductive system) rather than on physical appearance or behavioural characteristics;
- recognize that the essential difference between cold-and warm-blooded animals lies in different means of regulating body temperature;
- identify and describe the characteristics of vertebrates, and use these characteristics to classify vertebrates as mammals, birds, amphibians, reptiles, and fish (the five main classes);
- identify and describe the characteristics of invertebrates, and classify invertebrates into phyla (e.g., sponges, worms, molluscs, arthropods);
- compare the characteristics of vertebrates and invertebrates;
- compare the characteristics of different kinds of arthropods (e.g., crustaceans such as crayfish, shrimp; insects such as grasshoppers, butterflies, mealworms); E
- describe microscopic living things using appropriate tools to assist them with their observations (e.g., nets and microscopes for pond study); Mw
- describe ways in which micro-organisms meet their basic needs (e.g., for food, water, air, movement).

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 6, students will:

- formulate questions about and identify the needs of different types of animals, and explore possible answers to these questions and ways of meeting these needs (e.g., design an experiment to study whether certain insects will grow larger if given large quantities of food); AS*
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; AS*
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as organism, species, structure, and kingdom in describing classification of animals); AS*
- compile data gathered through investigation in order to record and present results, using charts, tables, labelled graphs, and scatter plots produced by hand or with a computer (e.g., make an inventory of animals found in a specific location); AS
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, charts, graphs, and drawings (e.g., create a clearly labelled chart of organisms observed and identified during a pond study). AS

Relating Science and Technology to the World Outside the School

By the end of Grade 6, students will:

- identify various kinds of classification systems that are based on specific criteria and used to organize information (e.g., in a telephone system, numbers are classified according to country code, area code, telephone number, extension number);
- identify inherited characteristics (e.g., eye colour, hair colour) and learned or behavioural characteristics (e.g., habits of cleanliness);

- explain why characteristics related to physical appearance (e.g., size, shape, colour, texture) or behaviour are not suitable attributes for classifying living things;
- identify various kinds of plant or animal organisms in a given plot using commercially produced biological or classification keys (e.g., organisms observed in a pond study, in the school yard, in wildlife centres);
- describe specific characteristics or adaptations that enable each group of vertebrates to live in its particular habitat (e.g., fish in water), and explain the importance of maintaining that habitat for the survival of the species; AS*
- explain how fossils provide evidence of changes in animals over geological time;
- compare similarities and differences between fossils and animals of the present.

Matter and Materials: Grade 1 – Characteristics of Objects and Properties of Materials

Overall Expectations

By the end of Grade 1, students will:

- distinguish between objects and materials (e.g., scissors are objects and they can be made of metal and/or plastic), and identify and describe the properties of some materials (e.g., flexibility of plastic, hardness of wood); SL
- investigate the properties of materials and make appropriate use of materials when designing and making objects; W, SL, CM
- describe the function of specific materials in manufactured objects that they and others use in daily life. W

Specific Expectations

Understanding Basic Concepts

By the end of Grade 1, students will:

- identify each of the senses and demonstrate understanding of how they help us recognize and use a variety of materials (e.g., our sense of sight enables us to determine whether a banana is ripe; our sense of hearing tells us whether the washing machine is working properly); O, W, SL, CM
- describe various materials using information gathered by using their senses (e.g., a piece of steel is hard, shiny, and cold, and makes a ringing noise when tapped; a ceramic bowl is hard and rough-textured, and makes a dull sound when tapped); SL
- identify properties of materials that are important to the purpose and function of the objects that are made from them (e.g., the flexibility of plastic makes plastic wrap useful for covering food in order to keep it fresh); W, SL
- describe, using their observations, ways in which materials can be changed to alter their appearance, smell, and texture (e.g., cooking changes the smell and texture of ingredients on a pizza; painting rough wood makes it smoother). C

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 1, students will:

- sort objects (e.g., students' coats, lunch bags, cooking utensils) and describe the different materials from which those objects are made; SL

- demonstrate ways in which various materials can be manipulated to produce different sounds (e.g., produce sounds by tapping the sides of glasses that contain different amounts of water) and describe their findings; So*
- design a usable product that is aesthetically pleasing (e.g., a tote bag, cookie, musical instrument) and construct it by combining and modifying materials that they have selected themselves; W, CM
- ask questions about and identify needs and problems related to objects and materials, and explore possible answers and solutions (e.g., test materials to determine which ones insulate more efficiently; test different fabrics to determine which are waterproof); W, SL, CM
- plan investigations to answer some of these questions or solve some of these problems; W, SL, CM
- use appropriate vocabulary in describing their investigations, explorations, and observations (e.g., use words such as soft, smooth, rough, and sticky when describing textures); W, SL, CM
- record relevant observations, findings, and measurements, using written language, drawings, charts, and concrete materials (e.g., make a display board and record the results of their testing of chalk on different materials); W, SL, CM
- communicate the procedures and results of investigations for specific purposes, using demonstrations, drawings, and oral and written descriptions (e.g., display examples of materials tested and indicate which ones were best for writing on). W, SL, CM

Relating Science and Technology to the World Outside the School

By the end of Grade 1, students will:

- describe how properties of materials (e.g., sounds, textures, lustre) help us learn about natural and human-made objects; SL
- identify materials that can be used to join and fasten other materials (e.g., tape for paper; thread for buttons); W, CM
- demonstrate ways of reusing materials and objects in daily activities (e.g., reuse of plastic containers for storing food);
- recognize that objects made of certain materials can be recycled (e.g., pop cans, plastic jugs, newspapers); S
- identify, through observation, the same material in different objects (e.g., cotton in shirts and towels; glass in magnifying glasses and windows; wood in pencils and furniture); SL
- compare objects constructed for similar purposes (e.g., different types of chairs) and identify the similarities and differences between their corresponding parts and the materials from which they are made (e.g., metal, wood);
- identify materials commonly used in manufactured objects as well as the source of those materials (e.g., wood from trees).

Matter and Materials: Grade 2 – Properties of Liquids and Solids

Overall Expectations

By the end of Grade 2, students will:

- demonstrate an understanding of the properties of familiar liquids (e.g., vinegar, detergent, water, oil) and solids (e.g., sugar, salt, sand), and of interactions between liquids and between liquids and solids; SL, S, C

- investigate the properties of and interactions between liquids and between liquids and solids, and identify the types of objects or materials that can be used to contain liquids and solids (e.g., a plastic bowl will hold a liquid or a solid but a paper towel will only hold a dry solid); SL, S, C
- identify and describe ways in which we use our knowledge of liquids and solids in making useful objects and in living in our environment. C

Specific Expectations

Understanding Basic Concepts

By the end of Grade 2, students will:

- describe the properties of liquids and solids, using their observations; SL
- distinguish between solids that dissolve in water (e.g., sugar) and solids that do not (e.g., sand); C
- describe, using their observations, the characteristics of the three states of water, and identify the conditions that cause changes from one state to another (e.g., water turns to ice when placed in a freezer); C
- recognize that the states of liquids and solids remain constant in some circumstances (e.g., solids remain solid when broken; liquids remain liquid when poured), but may change in other circumstances (e.g., liquids may freeze when the temperature drops; solids may melt when heated); C
- identify reversible changes in materials (e.g., the changing of ice to water); C
- identify, through observation, various substances that are buoyant (e.g., wood, oil), that can absorb another substance (e.g., paper towel), and that can dissolve another substance (e.g., water); SL, C
- evaluate the appropriateness of the materials chosen in the design and used in the construction of a structure that is intended to float (e.g., polystyrene, paper, metal, wood). SL

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 2, students will:

- design and assemble, using given materials, an object that is buoyant and able to support a given mass, and identify and describe the materials and tools they used; FS*
- ask questions about and identify needs and problems related to the use of liquids and solids, and explore possible answers and solutions (e.g., devise and explain a plan to build a model raft; predict changes that will occur when ice or water is heated or cooled) SL, C
- plan investigations to answer some of these questions or solve some of these problems, and describe the steps involved; SL, C
- use appropriate vocabulary in describing their investigations, explorations, and observations (e.g., use such words as clear, runny, and greasy when describing liquids, and granular, hard, and opaque when describing solids); SL, C
- record relevant observations, findings, and measurements, using written language, drawings, charts, and concrete materials (e.g., record data from experimentation with liquids and solids on a chart; list characteristics of different liquids that they have observed); SL, C
- communicate the procedures and results of investigations for specific purposes, using demonstrations, drawings, and oral and written descriptions (e.g., write a booklet for the school library describing class experiments in investigating liquids and solids). SL, C

Relating Science and Technology to the World Outside the School

By the end of Grade 2, students will:

- compare the properties of liquids with those of solids to determine which materials take the shape of their container (e.g., water will fill a margarine container completely but ice cubes will leave spaces); SL
- compare different materials with respect to their capacity to absorb, and identify ways in which this capacity determines how these materials are used (e.g., bond paper, paper towels, cotton, linen, wood, plastic);
- describe, using their observations, the behaviour of various liquids (e.g., water, oil) when poured on different surfaces (e.g., rough wood, smooth wood, cloth), when combined with solids (e.g., powdered milk), and when combined with other liquids (e.g., vinegar), and explain how the reactions they observe determine the uses of these liquids and solids; SL, C
- compare the properties of water with the properties of at least one other liquid (e.g., detergent, oil, molasses); SL
- identify liquids used in the home and describe how they are used (e.g., milk for drinking and cooking; detergent for cleaning);
- describe, using their observations, some ways in which solids and liquids can be combined to make useful substances (e.g., flour and water make paste); C
- identify objects in the immediate environment as solids (e.g., sand, ice, rocks) or liquids (e.g., milk, vinegar, water); SL
- recognize international symbols that give us information on the safety of substances (e.g., household cleaners, cleansers, bleaches) and Canadian Safety Association signage when working with liquids and solids.

Matter and Materials: Grade 3 – Magnetic and Charged Materials

Overall Expectations

By the end of Grade 3, students will:

[Note: STC does not address static electricity]

- demonstrate an understanding of the properties of materials that can be magnetized or charged and of how materials are affected by magnets or static electric charges; SL, RM
- identify and describe, using their observations, ways in which static electric charges are made in everyday materials, as well as different types of interactions that take place both between charged materials and between magnetized materials; SL
- identify familiar uses of magnets and give examples of static electric charges that are created in the home or at school. SL

Specific Expectations

Understanding Basic Concepts

By the end of Grade 3, students will:

- classify, using their observations, materials that are magnetic and not magnetic, and identify materials that can be magnetized (e.g., iron, nickel); MM*

- identify, through observation, the effect of different conditions on the strength of magnets and on static electric charges in materials (e.g., the effect of distance between magnets; the effect of moisture on charged materials); MM*
- compare different materials by measuring their magnetic strength or the strength of their electric charge (e.g., the number of paper clips that can be picked up by a magnetized needle; the number of tissue paper bits that can be picked up by a charged comb); MM*
- identify, through observation, pairs of materials that produce a charge when rubbed together (e.g., glass and silk; wool and hard rubber);
- describe and demonstrate how some materials that have been electrically charged or magnetized may either push or pull similar materials; SL*, RM
- determine, through observation, the polarity of a magnet (e.g., use a magnet of known polarity to test another magnet of unknown polarity); MM*
- identify materials that can be placed between a magnet and an attracted object without diminishing the strength of the attraction (e.g., construction paper); MM*
- predict, verify, and describe the interaction of two objects that are similarly charged (e.g., the interaction of two balloons after rubbing them on hair);
- describe, through observation, changes in the force of attraction at different distances, both for magnetic forces and for static electric forces. SL*, MM*

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 3, students will:

- design and construct a system that uses magnetic force to move an object (e.g., create a boat that holds paper clips, and move it through water using a magnet); MM*
- ask questions about and identify problems related to magnetic and static electric forces, and explore possible answers or solutions (e.g., investigate ways of producing static electric charges in different materials); SL*, MM*
- plan investigations to answer some of these questions or solve some of these problems, and explain the steps involved; SL*, MM*
- use appropriate vocabulary in describing their investigations, explorations, and observations (e.g., use terms such as north pole, south pole, attract, and repel when describing magnets, and charge, dry, humid, conductor, and insulator when describing static electricity); SL*, MM*
- record relevant observations, findings, and measurements, using written language, drawings, charts, and graphs (e.g., use a data table to show the number of times a needle can be magnetized and the results of testing magnetic strength); MM*
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using demonstrations, drawings, simple media works, and oral and written descriptions (e.g., demonstrate how an object moves through a magnetic maze they have created). MM*

Relating Science and Technology to the World Outside the School

By the end of Grade 3, students will:

- identify uses of magnets in familiar things (e.g., refrigerator magnets, compasses, door seal on a refrigerator, magnetic catches on cupboards); SL*, MM*
- describe examples of static electricity encountered in everyday activities (e.g., clothes clinging together after drying in a spin dryer; sparks made by touching objects after shuffling feet on carpets or by sliding down plastic playground slides in nylon snowsuits);

- identify ways in which static electricity can be used safely or avoided (e.g., use a charged sheet of plastic to pick up dust; moisten materials so they do not cling together).

Matter and Materials: Grade 4 – Materials That Transmit, Reflect, or Absorb Light or Sound

Overall Expectations

By the end of Grade 4, students will:

- demonstrate understanding that certain materials can transmit, reflect, or absorb light or sound; So
- investigate materials that transmit, reflect, or absorb light or sound and use their findings in designing objects and choosing materials from which to construct them; So
- explain why materials that transmit, reflect, or absorb light and/or sound are used in a variety of consumer products. So

Specific Expectations

Understanding Basic Concepts

By the end of Grade 4, students will:

- recognize and describe how different materials affect light (e.g., water and prisms bend light as it passes through them; mirrors and polished metals reflect light); Mw
- classify materials as transparent (e.g., glass, clear acrylic), translucent (e.g., frosted glass, white plastic shopping bags, tissue paper), or opaque (e.g., wood); RM, Mw
- demonstrate how opaque materials absorb light and thereby cast shadows;
- investigate, through explorations, ways in which different properties of materials, including their shape, affect the nature of sound (e.g., compare the sound produced by striking solid and hollow materials); So
- identify and describe, using their observations, physical changes in a material that can alter the sound it makes (e.g., the differences in sound when a loose rubber band and a stretched rubber band are plucked); So
- identify, using their observations, a variety of materials through which sound can travel (e.g., by ringing bells under water; by sending messages along a string). So

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 4, students will:

- design and make instruments for a specific purpose or function (e.g., make magnifiers from a glass jar half filled with water; make drums from boxes or margarine containers with lids); So, Mw
- formulate questions about and identify problems related to the ways in which materials transmit, reflect, or absorb sound or light, and explore possible answers or solutions (e.g., predict and verify the size, shape, and location of shadows from a given light source, or the types of materials that will make ringing sounds when struck); So
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; So, Mw

- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations, explorations, and observations (e.g., use terms such as translucent, opaque, reflection, absorption, and conductivity to describe properties of materials in relation to light and sound); RM, So, Mw
- compile data gathered through investigation in order to record and present results, using tally charts, tables, and labelled graphs produced by hand or with a computer (e.g., create a table to show the types of sounds made by hollow objects, such as a coffee can full of air, and by solid objects, such as a coffee can filled with sand); RM, So, Mw
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using oral presentations, written notes and descriptions, drawings, and charts (e.g., create a shade chart of a selected colour; make a spinning colour wheel to demonstrate how “white” light is composed of all the colours). RM, So, Mw

Relating Science and Technology to the World Outside the School

By the end of Grade 4, students will:

- classify materials that transmit, absorb, or reflect energy as natural or human-made (e.g., wood, metal, clay, plastic, fabric);
- identify transparent, translucent, and opaque materials used in objects in the immediate environment, and evaluate whether the ability of these materials to transmit, reflect, or absorb light enhances the objects’ usefulness (e.g., usefulness of translucent white plastic shopping bags versus opaque paper shopping bags; use of coloured glass to preserve food or drink from light);
- describe, using their observations, how substances employed in finishing processes can alter a material’s ability to transmit, absorb, or reflect light or sound (e.g., how choice of paint can affect the reflective ability of the surface to be painted);
- describe and demonstrate, using different materials, ways of mixing colours to create new colours (e.g., by overlapping coloured acetates; by mixing paints);
- compare the intensity of light passing through different materials, and identify how the differences might determine the uses of these materials;
- identify different types of light observed in the immediate environment (e.g., neon lights, rainbows, flashlights) and compare them (e.g., with respect to colour, intensity);
- compare materials in terms of the sounds that they can be made to produce (e.g., by plucking a rubber band, beating a drum, tapping glasses filled to different levels with water, shaking a jar of macaroni, blowing air past a blade of grass placed between the thumbs); So
- investigate objects in the home and community that are designed and made to produce sounds (e.g., doorbells, sirens, telephones, radios, stereos, smoke detectors, security system alarms); So
- describe some ways in which materials that absorb sound are used (e.g., in concert halls, adjacent movie theatres, ear plugs, highway sound barriers);
- describe practices that ensure their safety and that of others (e.g., use of ear plugs in situations involving excessive noise; use of reflective or fluorescent materials on clothes at night).

Matter and Materials: Grade 5 – Properties of and Changes in Matter

Overall Expectations

By the end of Grade 5, students will:

- demonstrate an understanding of the three states of matter and of changes in state; W*, SL*, C*, LW

- investigate common changes of state (e.g., melting, freezing, condensing, evaporating) and make informed choices about materials when finding solutions to problems in designing and constructing objects; W*, SL*, C*, LW
 - identify the properties that make different materials useful in everyday products and discuss the environmental impact of their use. E

Specific Expectations

Understanding Basic Concepts

By the end of Grade 5, students will:

- identify and describe some changes to materials that are reversible and some that are not (e.g., freezing and melting are reversible; burning is not); C*, CT*, FC, TP
- describe changes they observe in the properties of materials when the materials interact with each other (e.g., when paints are mixed; when water is combined with gelatine); C*, CT*, FC, TP
- describe examples of interactions between materials that result in the production of a gas (e.g., antacid tablets in water, baking soda in vinegar); C*, CT*
- identify the three different states of matter – solid, liquid, and gas – and give examples of each state (e.g., solid: sugar, rock; liquid: water, oil, gasoline; gas: water vapour, air, oxygen); SL*, C*
- identify the characteristic properties of each of the three states of matter and group materials on the basis of these properties (e.g., solids have definite volume and hold their shape; liquids have definite volume but take the shape of their container; gases have no definite volume and take the volume and shape of their container); SL*, C*
- recognize, on the basis of their observations, that melting and evaporation require heat C*
- use a thermometer to measure the temperature of a material; W*, EP
- identify melting, freezing, condensation, and evaporation as changes of state that can be reversed; C*, LW
- describe, using their observations, non-reversible changes that occur when some materials are heated (e.g., when paper is burnt; when an egg is cooked); C*, CT*, FC, TP
- investigate and describe the changes in the relative volume, shape, and temperature of materials when pressure is applied to them (e.g., the effects of using a hammer on clay or of sitting on a beach ball with the stopper removed). FS

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 5, students will:

- design and make a device or product that minimizes heat loss (e.g., a coffee mug, a Thermos flask, an insulated lunch bag);
- conduct a fair test to determine the effectiveness of a variety of commercial products designed for the same purpose (e.g., compare the adhesive qualities of different types of glue); TP
- formulate questions about and identify needs and problems related to the properties and changes in state of familiar materials, and explore possible answers and solutions (e.g., estimate and then measure the length of time certain foods take to melt when heated; design a test to compare the insulating effects of different thicknesses of foam polystyrene); EC, MD, FC, FS, MM, TP

- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; MD, FS, MM, TP
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as texture, hardness, strength, buoyancy, solubility, and flexibility to describe properties of materials); CT*, EC, MD, FC, FS, MM, TP
- compile data gathered through investigation in order to record and present results, using tally charts, tables, and labelled graphs produced by hand or with a computer (e.g., record the reactions of different materials when vinegar is dropped on them, and use a data table to present their findings); CT*, EC, MD, FC, FS, MM, TP
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, drawings, and charts (e.g., make accurate and detailed drawings of sugar crystals, as seen both with the unaided eye and through a magnifying glass or microscope). CT*, EC, MD, Mw, FC, FS, MM, TP

Relating Science and Technology to the World Outside the School

By the end of Grade 5, students will:

- identify the source of the materials found in a product (e.g., plastic is made from petroleum) and describe the steps required to modify the natural materials to make the product; Mw, FC, TP
- describe how physical and chemical processes change materials found at home and materials used in industry (e.g., cooking, the manufacturing of plastics); FC, TP
- describe physical changes and chemical reactions that can take place in household products and explain how these reactions affect the use of the products (e.g., the role of baking soda in cooking; the role of heat in cooking an egg); CT*, FC, TP
- measure, in different materials, observable changes that result from such processes as rusting, dissolving, and bleaching, and identify products that are affected by these processes (e.g., metals, powdered foods, fabrics); C*, CT*, FC, TP
- describe chemical changes that can be caused in a substance, and explain how the changes affect the use and function of the substance (e.g., changes caused by exposing newspaper or construction paper to light, exposing an apple section to air); C*, CT*, FC, TP
- compare the mass of a substance in its liquid and solid states (e.g., compare the mass of ice cubes or chocolate squares with the mass of the liquid that results when they are melted);
- relate the mass of a whole object to the sum of the masses of its parts (e.g., measure the mass of a given amount of salt, the mass of a given amount of water, and the mass of the container for the water, and compare the sum of those masses with the mass of the container and the mixture of salt and water; measure the separate masses of the ingredients for a salad and the salad bowl, and compare the sum of those masses with the mass of the bowl and the salad).

FS

Matter and Materials: Grade 6 – Properties of Air and Characteristics of Flight

Overall Expectations

By the end of Grade 6, students will:

[Note: Flight is not addressed in the STC curriculum; however, the use of a propeller as a device to produce motion and aerodynamic drag is investigated in the STC unit Motion and Design. Motion and Design is a study of factors (such as, force and mass) that can change the motion of an object. Such knowledge is foundational to an understanding of the principals of flight.]

- demonstrate an understanding of the properties of air (e.g., air and other gases have mass) and explain how these can be applied to the principles of flight; MD* (in part)
- investigate the principles of flight and determine the effect of the properties of air on materials when designing and constructing flying devices; MD* (in part)
- identify design features (of products or structures) that make use of the properties of air, and give examples of technological innovations that have helped inventors to create or improve flying devices. MD* (in part)

Specific Expectations

Understanding Basic Concepts

By the end of Grade 6, students will:

- recognize that gravity does not depend on the presence of air;
- demonstrate understanding that gases expand to fill a space;
- demonstrate that air expands when heated (e.g., heat a garbage bag partially filled with air using a blow dryer);
- demonstrate and explain how the shape of a surface over which air flows affects the role of lift (Bernoulli's principle) in overcoming gravity (e.g., changing the shape of airplane wings affects the air flow around them);
- demonstrate and describe methods used to alter drag in flying devices (e.g., flaps on a jet aircraft's wings); MD* (in part)
- explain the importance of minimizing the mass of an object when designing devices to overcome the force of the earth's gravity; MD* (in part)
- describe the sources of propulsion for flying devices (e.g., moving air, propellers, combustible fuel); MD* (in part)
- describe how unbalanced forces are used to steer airplanes and spacecraft (e.g., rocket firings to control docking in space). MD* (in part)

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 6, students will:

- design, construct, and test a structure that can fly (e.g., a kite, a paper airplane, a hot air balloon);
- design and create a device that uses pneumatic power to move another object;
- formulate questions about and identify needs and problems related to the properties of air and characteristics of flight, and explore possible answers and solutions (e.g., investigate whether the shape of a plane affects its flight path); MD* (in part)
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; MD* (in part)
- use appropriate vocabulary, including correct science and technology terminology, to communicate ideas, procedures, and results (e.g., use terms such as lift, thrust, streamline, and aerodynamics when discussing flight materials); MD* (in part)

- compile data gathered through investigation in order to record and present results, using tally charts, tables, labelled graphs, and scatter plots produced by hand or with a computer (e.g., record the flight distances of different styles of paper airplanes, and present their findings in a graph); MD*
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, written notes and descriptions, charts, graphs, drawings, and oral presentations (e.g., hold an invention convention on things that fly). MD*

Relating Science and Technology to the World Outside the School

By the end of Grade 6, students will:

- identify devices that involve the application of Bernoulli's principle (e.g., paint sprayer, carburetor);
- describe how the properties of air, such as its compressibility and insulating quality, are used in common products (e.g., automobile tires, double-glazed glass, sleeping bags, fire extinguishers);
- describe and justify the differences in design between various types of flying devices (e.g., airplane versus helicopter, spacecraft versus hot-air balloon);
- identify characteristics and adaptations that enable birds and insects to fly;
- compare living things to identify the different features that allow them to be transported by wind (e.g., differences among spores, pollen, seeds);
- describe milestones in the history of air and space travel;
- compare the special features of different transportation methods that enable those methods to meet different needs (e.g., features of bicycles, cars, airplanes, spacecraft); MD*
- assess whether the materials in student-designed projects were used economically and effectively (e.g., decide whether paper was wasted during the construction of paper airplanes); MD*
- describe practices that ensure their safety and that of others (e.g., directing flying objects away from oneself and others). MD*

Energy and Control: Grade 1 – Energy in Our Lives

Overall Expectations

By the end of Grade 1, students will:

- demonstrate an understanding of ways in which energy is used in daily life; EC*, MD*
- investigate some common devices and systems that use energy and ways in which these can be controlled manually; EC*, MD*
- describe different uses of energy at home, at school, and in the community, and suggest ways in which energy can be conserved. EC*, MD*, MM*

Specific Expectations

Understanding Basic Concepts

By the end of Grade 1, students will:

- recognize that the sun is the principal source of energy used on the surface of the earth; O, W

- identify food as a source of energy for themselves and other living things; FC*
- identify everyday uses of energy (e.g., gas to heat our homes, electricity to cook our food); EC*
- describe how our senses of touch, hearing, and sight help us to control energy-using devices in the home, school, and community (e.g., our sensitivity to heat and cold (sense of touch) tells us to turn a tap to adjust the water temperature; our sense of hearing tells us to turn off the alarm clock; our sense of sight tells us when to apply the brakes on our bicycle). W

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 1, students will:

- construct a manually controlled device that performs a specific task (e.g., a folding fan); So*, EC*, MD*
- operate a simple device or system and identify the input and output (e.g., a hair dryer: the input is electricity, the output is heat); EC*
- ask questions about and identify needs and problems related to energy production or use in the immediate environment, and explore possible answers and solutions (e.g., discuss how people might cope with a power failure at home – by using candles for light, the barbecue for outdoor cooking, the fireplace for heat);
- plan investigations to answer some of these questions or solve some of these problems; So*, EC*, MD*
- use appropriate vocabulary in describing their investigations, explorations, and observations (e.g., use words such as electricity, lights, energy); So*, EC*, MD*
- record relevant observations, findings, and measurements using written language, drawings, concrete materials, and charts (e.g., create an energy poster illustrating the various forms of energy used in daily life and how they are controlled); So*, EC*, MD*
- communicate the procedures and results of investigations and explorations for specific purposes, using demonstrations, drawings, and oral and written descriptions (e.g., prepare a chart of energy conservation practices at home; prepare a chart illustrating how their senses help them use and control everyday devices). So*, EC*, MD*

Relating Science and Technology to the World Outside the School

By the end of Grade 1, students will:

- describe the different forms of energy used in a variety of everyday devices (e.g., coiled springs in wind-up toys, wood in fireplaces); EC*, MD*
- identify everyday devices that are controlled manually (e.g., a cassette recorder, lights); So*, EC*, MD*
- identify devices they use that consume energy (e.g., lights, computers) and list things they can do to reduce energy consumption (e.g., turn lights out when leaving a room); EC*, MD*
- select one of the most common forms of energy used every day and predict the effect on their lives if it were no longer available. EC*

Energy and Control: Grade 2 – Energy From Wind and Moving Water

Overall Expectations

By the end of Grade 2, students will:

- demonstrate an understanding of the movement of air and of water as sources of energy; LW*, MD*
- design and construct devices that are propelled by moving air or moving water; MD*
- identify wind and moving water as renewable sources of energy and determine the advantages and disadvantages of using them. LW*

Specific Expectations

Understanding Basic Concepts

By the end of Grade 2, students will:

- identify movement as an outcome of energy input (e.g., fuel enables cars, trucks, and buses to move; electricity enables the fan in the kitchen to move; food enables humans to move); MD*
- recognize that it is the movement of air and water that produces energy and that air and water are not by themselves sources of energy;
- identify various ways in which moving water is used as a form of energy (e.g., hydroelectricity, tidal energy). LW*

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 2, students will:

- design and construct a device propelled by air (e.g., a kite, a pinwheel, a balloon rocket); MD*
- design and construct a system that controls the flow of water and/or air using a variety of mechanisms (e.g., a musical instrument, a fountain, valves, a dam); So, LW*
- ask questions about and identify needs and problems related to the use of wind and moving water as energy sources, and explore possible answers and solutions (e.g., describe how moving water is used to produce electricity; describe how windmills were used to grind grain into flour); LW*, MD*
- plan investigations to answer some of these questions or solve some of these problems, and describe the steps involved; LW*, MD*
- use appropriate vocabulary in describing their investigations, explorations, and observations (e.g., use terms such as renewable and movement when describing energy); LW*, MD*
- record relevant observations, findings, and measurements, using written language, pictures, and charts (e.g., draw a diagram of their device; prepare a chart to present data on the distance travelled by their device over time); So, LW*, MD*
- communicate the procedures and results of investigations and explorations for specific purposes, using drawings, demonstrations, and oral and written descriptions (e.g., prepare a showcase of different devices that are propelled by wind energy; explain the effect of wind direction and speed on the displacement of wind-propelled devices). So, LW*, MD*

Relating Science and Technology to the World Outside the School

By the end of Grade 2, students will:

- identify devices that use moving air and moving water as energy sources (e.g., windmills, water wheels), and describe what happens to these devices when the air or water is still; LW*

- list activities that are affected by moving water and wind (e.g., fishing, sailing, flying a plane); W
- recognize that moving air and moving water can be sources of energy for electrical power; LW*
- describe how gravity and the shape of different structures affect the behaviour and use of moving water (e.g., water in waterfalls, taps, fountains). LW*

Energy and Control: Grade 3 – Forces and Movement

Overall Expectations

By the end of Grade 3, students will:

- demonstrate an understanding of how movement is caused by forces and by energy that is stored and then released; MD
- investigate how different forces affect the operation of everyday devices, and design and construct devices that use a form of energy to create controlled movement; MD
- identify objects, devices, and systems in everyday life that are affected by forces and movement and explain in what ways they are useful to us. MD

Specific Expectations

Understanding Basic Concepts

By the end of Grade 3, students will:

- identify force as a push or pull by one body on another; MD
- investigate the ways in which different forces (e.g., magnetism, static electricity, muscular force, gravitational force) can change the speed or direction of a moving object; MD
- investigate the effect of magnets and electrically charged objects on the motion of different materials (e.g., iron filings will be moved by a magnet, whereas grains of sugar will not); MM*
- identify, through observation, different forms of energy and suggest how they might be used to provide power to devices and to create movement (e.g., the release of energy from a tightly wound rubber band or spring would create movement in a wind-up toy); EC, MD
- distinguish between kinds of motion and indicate whether the motion is caused indirectly (e.g., by gravity, static electricity, magnets) or directly (e.g., by applied force); MD
- investigate the effects of directional forces (e.g., left push for left movement) and how unbalanced forces can cause visible motion in objects that are capable of movement (e.g., an object pushed over a smooth floor). MD

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 3, students will:

- ask questions about and identify needs and problems related to the behaviour of different forces in their immediate environment, and explore possible answers and solutions (e.g., identify everyday situations that produce static electricity and describe ways of removing static electricity from clothes; compare the strength of two magnets in holding layers of paper on a refrigerator door, or in picking up paper clips); MD, MM*
- plan investigations to answer some of these questions or solve some of these problems, and explain the steps involved; MD, MM*

- use appropriate vocabulary in describing their investigations, explorations, and observations (e.g., use terms such as push, pull, load, distance, speed when describing the effect of forces on an object); MD, MM*
- record relevant observations, findings, and measurements, using written language, drawings, charts, and graphs (e.g., track a toy boat moving on water at various speeds, record the distances travelled, and present their findings on a chart); MD, MM*
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using drawings, demonstrations, simple media works, and oral and written descriptions (e.g., give a demonstration showing how a device has been constructed and how it performs; make a drawing showing what alterations would be made to its design in the future; describe in writing the steps they used to build a device); MD, MM*
- design and construct a device that uses a specific form of energy in order to move (e.g., a paper airplane propelled by hand). MD

Relating Science and Technology to the World Outside the School

By the end of Grade 3, students will:

- describe the visible effects of forces acting on a variety of everyday objects (e.g., a toy car goes forward when pushed; a ball falls down when dropped); MD
- identify surfaces that affect the movement of objects by increasing or reducing friction (e.g., dry roads, icy roads); MD
- demonstrate how a magnet works and identify ways in which magnets are useful (e.g., as metal detectors, as a car wrecker's hoist, as a power source for magnetic trains); SL*, RM, MM*
- recognize devices that are controlled automatically (e.g., timers, washing machines), at a distance (e.g., a remote-control toy), or by hand (e.g., the flushing mechanism on a toilet);
- identify parts of systems used in everyday life, and explain how the parts work together to perform a specific function (e.g., a subway system, a plant, a wind-up toy). So, LW, EC, MD

Energy and Control: Grade 4 – Light and Sound Energy

Overall Expectations

By the end of Grade 4, students will:

- demonstrate an understanding of the characteristics and properties of light and sound; So, Mw
- investigate different ways in which light and sound are produced and transmitted, and design and make devices that use these forms of energy; So, EC, Mw
- identify technological innovations related to light and sound energy and how they are used and controlled at home and in the community, and determine how the quality of life has been affected by these innovations. So, EC

Specific Expectations

Understanding Basic Concepts

By the end of Grade 4, students will:

- identify a variety of natural and artificial light sources (e.g., the sun, a candle, a light bulb); EC, E

- describe the behaviour of light, using their observations, and identify some of its basic characteristics (e.g., that it travels in a straight path, bends as it passes from one medium to another, and is reflected off shiny surfaces); Mw
- distinguish between objects that produce their own light and those that reflect light from another source (e.g., candles and the sun emit their own light; the moon reflects light from the sun); EC
- identify, through observation, colour as a property of light (e.g., use prisms to show that white light can be separated into colours);
- predict the location, shape, and size of a shadow when a light source is placed in a given location relative to an object; MT*
- investigate and compare how light interacts with a variety of optical devices (e.g., kaleidoscopes, periscopes, telescopes, magnifying glasses); Mw
- recognize, using their observations, that most objects give off both light and heat (e.g., the sun, a candle, a light bulb), and identify some objects that give off light but produce little or no heat (e.g., light sticks, fireflies); EC
- recognize, using their observations, that sound can travel through a substance (e.g., place a vibrating tuning fork in a shallow dish of water and describe what happens to the water; place rice on a drum-head and describe what happens to the rice when the drum is tapped); So
- group a variety of sounds according to pitch and loudness and demonstrate how the sounds can be modified; So
- compare the range of sounds that humans can hear with the range of sounds that other animals can hear (e.g., dogs and cats can hear higher frequencies than humans); So
- recognize that sounds are caused by vibrations; So
- describe how the human ear is designed to detect vibrations. So

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 4, students will:

- formulate questions about and identify needs and problems related to their own experiences with light and sound, and explore possible answers and solutions (e.g., identify different sounds and their sources in their environment); So, EC, Mw
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; So, EC, Mw
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as source, artificial, beam of light, reflection in describing the behaviour of light; or pitch, loudness, vibrations in describing sounds); So, EC, Mw
- compile data gathered through investigation in order to record and present results, using tally charts, tables, and labelled graphs produced by hand or with a computer (e.g., create a “sound diary” to record the sounds encountered over a period of time); So, EC, Mw
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, drawings, and charts (e.g., draw diagrams showing the position of the light source and location of the shadow; create a chart showing how devices that rely on or provide light and sound contribute to the user’s convenience and comfort); So, EC, Mw
- design, make, and test an optical device (e.g., a periscope, a kaleidoscope);
- design and make musical instruments, and explain the relationship between the sounds they make and their shapes; So

- follow safe work procedures in all investigations (e.g., direct mirrors away from the sun to ensure that the sun's rays are not reflected into their eyes or the eyes of others; avoid producing excessively loud sounds). All STC units

Relating Science and Technology to the World Outside the School

By the end of Grade 4, students will:

- identify various uses of sounds encountered daily (e.g., warning sounds such as security alarms, fire sirens, smoke detector alarms); So
- describe the harmful effects of high noise levels and identify potential noise hazards at home or in the community (e.g., some leaf-blowing machines); So
- describe, using their observations, how sounds are produced in a variety of musical instruments (e.g., wind instruments) and identify those they like listening to best; So
- identify sound-related jobs (e.g., tuning pianos) and the role of sound in different jobs (e.g., the beep that warns us a van is backing up; the noise of jackhammers as an occupational hazard); So
- describe devices that extend our ability to see and hear (e.g., a telescope, a magnifying glass, an optical microscope, a hearing aid, a microphone or megaphone); So, Mw
- identify different uses of light at home, at school, or in the community, and explain how their brightness and colour are related to their purpose (e.g., vivid neon lights are used for advertising; blue lights are used to identify snow-removal vehicles; dim lighting is used to create a soothing atmosphere in restaurants); EC
- describe the effect on the quality of life if light and sound could not be used as forms of energy; So, EC
- identify common phenomena related to light and sound (e.g., rainbows, shadows, echoes) and describe the conditions that create them; So, Mw
- identify systems that use light or sound sensors to detect movement (e.g., motion detectors, check-out scanners, the eye, the ear). So, Mw

Energy and Control: Grade 5 – Conservation of Energy

Overall Expectations

By the end of Grade 5, students will:

- demonstrate an understanding of the importance of conservation of energy in relation to the wise use of renewable and non-renewable energy sources;
- design and construct devices that use a form of energy to meet a specific need or want, and investigate how the energy is transferred to a specified output; EC, MD
- evaluate the reasons for conserving natural resources and identify possible ways of conserving energy. TP

Specific Expectations

Understanding Basic Concepts

By the end of Grade 5, students will:

- distinguish between a renewable and a non-renewable source of energy;
- investigate ways energy can be stored for later use (e.g., mechanical energy is stored in an elastic band or steel spring; chemical energy is stored in a battery); EC, MD, MT, MM

- describe how energy is stored and transferred in a given device or system (e.g., in an automobile, chemical energy stored in the gasoline is transformed into mechanical energy upon combustion, enabling the vehicle to move and releasing thermal energy as heat); MD, MM
- recognize that energy cannot be created or destroyed but can only be changed from one form into another (e.g., chemical energy in a battery becomes electrical energy); EC, MD, MM
- operate a mechanical device or system that uses a sensory or time-based input (e.g., a timer for lights) and describe how energy is transferred to a specified output.

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 5, students will:

- formulate questions about and identify needs and problems related to protection of the natural environment, and explore possible answers and solutions (e.g., investigate how local recycling efforts help conserve energy and natural resources); S*, E, TP
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; E, TP
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as heat, light, sound, electrical, mechanical, magnetic, chemical when describing forms of energy); E, TP
- compile data gathered through investigation in order to record and present results, using tally charts, tables, and labelled graphs produced by hand or with a computer (e.g., list the names of some devices used in the home that change energy from one form into another, and record in a table the types of energy transformations for each device); E, TP
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, drawings, and charts (e.g., use a word processor and graphics program to create a booklet about the design, construction, and effectiveness of a product that meets a specific need; debate the environmental implications of using various sources of energy); E, TP
- design devices that can transform one form of energy into another (e.g., an electric bell transforms electrical energy into sound energy). EC, MD, MT, MM

Relating Science and Technology to the World Outside the School

By the end of Grade 5, students will:

- list various sources of energy and identify them as renewable (e.g., sun, wind, tides, wood) or non-renewable (e.g., coal, natural gas, oil); LW
- describe the advantages and disadvantages of using renewable energy sources as opposed to non-renewable sources;
- identify the forms of energy (e.g., mechanical, electrical) used in the home, school, and community and identify the energy source for each (e.g., wood, coal, moving water); EC, MD, MM
- describe how we use different natural resources as sources of energy and evaluate the effect of their use on natural and human-made environments (e.g., in using fossil fuels such as natural gas for heating our homes we deplete natural resources but improve our quality of life); E
- explain ways in which technological innovations affect our use of natural resources and increase or decrease our ability to conserve energy (e.g., home insulation allows us to conserve heat and reduce consumption of energy from non-renewable sources); E

- identify factors that determine how effectively and economically a device can transform one form of energy into another (e.g., discuss the advantages and disadvantages of using solar panels for heating);
- explain how humans rely on energy transfers from a variety of products and systems to survive (e.g., chemical energy from food becomes muscular energy in humans); EC, MD, FC, MM
- identify ways humans use energy, evaluate the economic and environmental costs of each, and describe ways to avoid wasting energy (e.g., lowering the thermostat during the night); E
- identify design features that improve the energy efficiency of buildings, devices, and systems (e.g., double glazing). MD

Energy and Control: Grade 6 – Electricity

Overall Expectations

By the end of Grade 6, students will:

- demonstrate understanding that electrical energy can be transformed into other forms of energy; EC*, MM
- design and construct a variety of electrical circuits and investigate ways in which electrical energy is transformed into other forms of energy; EC*, MM
- identify uses of electricity in the home and community and evaluate the impact of these uses on both our quality of life and the environment. EC*, E, MM

Specific Expectations

Understanding Basic Concepts

By the end of Grade 6, students will:

- investigate ways in which electrical energy can be transformed into other forms of energy (e.g., into light, heat, and sound); EC*, MM
- compare the conductivity of a variety of solids and liquids; EC*
- identify, through experimentation, ways in which chemical energy can be transformed into electrical energy (e.g., build a circuit using a lemon or a potato); EC*, MM
- compare the characteristics of current and static electricity;
- describe the relationship between electricity and magnetism in an electromagnetic device; MM
- identify, through observation, the effects of using different types of core materials in building an electromagnet; MM
- identify different types of switches that are used to control electrical devices (e.g., contact, tilt) and explain the key differences among them (e.g., differences in design, use).

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 6, students will:

- formulate questions about and identify needs and problems related to the properties or uses of electrical energy, and explore possible answers and solutions (e.g., compare some sources of electrical energy used in the past, such as coal, with sources used today, such as uranium and moving water, and evaluate the advantages and disadvantages of each); E

- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; E
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as current, battery, circuit, conductor, insulator; positive (plus) and negative (minus) charges for electrically charged materials; north pole and south pole for magnetic materials); EC*, E, MM
- compile data gathered through investigation in order to record and present results, using tally charts, tables, labelled graphs, and scatter plots produced by hand or with a computer (e.g., record in a journal all daily uses of electrical energy for a week, classify the various uses, and present the findings using tables and graphs); EC*, E, MM
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, drawings, and charts (e.g., draw a diagram of an electrical circuit using appropriate symbols; create a brochure outlining safe and unsafe uses of electricity; create a table showing different factors that could lead to a decrease in consumption of electrical energy in the home and at school); EC*, E, MM
- design and build electrical circuits (e.g., series circuits and parallel circuits) and describe the function of their component parts (e.g., switches, power source); EC*, MM
- build and test an electrical circuit that performs a useful function, and draw a diagram of it using appropriate electrical symbols; EC*, MM
- construct series circuits (e.g., logical AND) and parallel circuits (e.g., logical OR) to control a device, and compare their characteristics; EC*
- design and construct an electrical system that operates a device in a controlled way (e.g., a switch provides a controlled input, and lamps, buzzers, or motors produce the output). EC*, MM

Relating Science and Technology to the World Outside the School

By the end of Grade 6, students will:

- identify sources of electricity and state whether the sources are renewable or non-renewable; LW*, EC*, E, MM
- recognize the use of electromagnets in motors and generators; MM
- describe the electrical conversions in everyday devices or systems (e.g., electrical energy to heat energy in a toaster; electrical energy to mechanical energy in an electric mixer); EC*, MM
- identify the different ways electricity is produced (e.g., by batteries using chemical energy; by dams using water power; by generating stations using nuclear energy) and evaluate the effect of different production methods on natural resources and living things in the environment; LW*, EC*, E, MM
- describe conditions that could affect the consumption of electrical energy in the home and at school (e.g., seasonal variations in heat and light requirements); E
- identify devices that use electricity to send signals (e.g., televisions, telephones, radios, computers);
- describe how electricity was discovered and harnessed for use (e.g., name some inventions) and discuss whether we are more or less dependent on electricity than people in the past; MM
- develop a plan for reducing electricity consumption at home or at school, and assess how this change could affect the economy (e.g., jobs) and our use of natural resources. E

Structures and Mechanisms: Grade 1 – Everyday Structures

Overall Expectations

By the end of Grade 1, students will:

- demonstrate awareness that structures have distinctive characteristics. BW
- design and make structures that meet a specific need;
- demonstrate understanding of the characteristics of different structures and of ways in which they are made, and recognize and use some systems in the home or at school. BW

Specific Expectations

Understanding Basic Concepts

By the end of Grade 1, students will:

- explain the function of different structures (e.g., house, car, bridge, chair, umbrella, television, wheelbarrow); BW
- identify ways in which various structures are similar to and different from others in form and function (e.g., rooms all have walls but are different in size and are used for different purposes; rubber balls are round and solid whereas balloons are round and hollow); SL, BW
- classify various structures in their environment (e.g., fences, stairs, ladders, bridges, water towers) according to specific features (e.g., size, materials) and functions; SL, CM, BW
- identify geometric shapes (e.g., square, triangle, circle) in ordinary structures; SL
- describe patterns that are produced by the repetition of specific shapes or motifs in various materials and objects (e.g., the pattern formed by triangles in a bridge or by flowers on wallpaper).

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 1, students will:

- design and make different structures using concrete materials, and explain the function of the structure (e.g., a toy bridge, a slide for testing a marble); W, SL, CM, S, C, BW
- ask questions about and identify needs or problems related to structures in their immediate environment, and explore possible answers and solutions (e.g., make a box or a net in which to store a toy that has several pieces); W, SL, CM
- plan investigations to answer some of these questions or solve some of these problems; W, SL, CM, C, BW
- use appropriate vocabulary in describing their investigations, explorations, and observations (e.g., use words such as triangle, tall, and zigzag in describing shapes; use input and output in describing the operation of a machine); W, SL, CM, S, C, BW
- record relevant observations, findings, and measurements, using written language, drawings, charts, and concrete materials (e.g., record the number of different shapes in a playground and draw them); W, SL, CM, S, C, BW
- communicate the procedures and results of investigations and explorations for specific purposes, using demonstrations, drawings, and oral and written descriptions (e.g., set up a display of different cooking utensils and identify the function of each utensil); W, SL, CM, S, C, BW
- use appropriate natural and manufactured materials to make structures (e.g., cut paper, mix sand and water, combine pipe cleaners, use modeling clay); W, SL, CM, S, C, BW

- select appropriate tools and utensils (e.g., pencil, paintbrush, scissors, hacksaw, spoon, measuring cup); W, SL, CM, S, C, BW
- use tools appropriately when joining and shaping various materials (e.g., nails, glue, sandpaper). W, SL, CM, S, C, BW

Relating Science and Technology the World Outside the School

By the end of Grade 1, students will:

- distinguish between structures and devices made by humans (e.g., houses, toys, televisions) and structures found in nature (e.g., bird nests, honeycombs); All STC units
- explain the function of a structure that they have made and describe how they made it (e.g., a bridge, a castle); W, SL, CM, BW
- identify structures whose function is indicated by their shape (e.g., railway-crossing barrier, stop sign, key); SL, CM
- examine different kinds of fasteners (e.g., tape, button, zipper) and indicate where they are used;
- use and recognize the effects of different kinds of finishing techniques and processes (e.g., painting, adding decals) on structures they have designed and made;
- recognize that a product is manufactured to meet a need (e.g., scissors for cutting paper; coping saws for cutting wood);
- identify the action (input) required to operate an everyday system (e.g., pressing a button to ring a doorbell), and identify the response (output) of that system (e.g., the ringing of the doorbell); CM, BW
- describe, using their own experience, how the parts of some systems work together (e.g., wheels and axle; pulley and string). CM, S, BW

Structures and Mechanisms: Grade 2 – Movement

Overview

Overall Expectations

By the end of Grade 2, students will:

- describe the position and movement of objects, and demonstrate an understanding of how simple mechanisms enable an object to move; design and make simple mechanisms, and investigate their characteristics; W, SL, CM, C, BW
- recognize that different mechanisms and systems move in different ways, and that the different types of movement determine the design and the method of production of these mechanisms and systems. W, SL, BW

Specific Expectations

Understanding Basic Concepts

By the end of Grade 2, students will:

- describe different mechanisms through observation and investigation (e.g., hinge, inclined plane), and identify the components that are simple machines (e.g., lever, wedge); BW
- describe, using their observations, the characteristics and movements of simple mechanisms (e.g., hinge, wheels and axle); BW

- describe, using their observations, the position of an object in relation to other objects or to a specific area (e.g., use such words as over, under, beside, behind); SL, BW
- identify changes in the position of an object in relation to other objects (e.g., movement upward or to the left); BW
- describe, using their observations, the pattern of movement of objects (e.g., turning, spinning, swinging, bouncing, vibrating). SL, BW

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 2, students will:

- ask questions about and identify needs or problems related to structures and mechanisms, and explore possible answers and solutions (e.g., investigate the effect of different floor coverings on the motion of a toy car); BW, MD*
- plan investigations to answer some of these questions or solve some of these problems, and describe the steps involved; BW, MD*
- use appropriate vocabulary to describe their investigations, explorations, and observations (e.g., use words such as rotate, turn, faster, and slower to describe the motion of wheels and axles); BW, MD*
- record relevant observations, findings, and measurements, using written language, drawings, charts, and concrete materials (e.g., record what happens to the movement of a vehicle released from a ramp if the size of its wheels is changed); SL, BW, MD*
- communicate the procedures and results of investigations and explorations for specific purposes, using drawings, demonstrations, and oral and written descriptions (e.g., draw a sketch of an object they plan to make and another sketch of the object after it is made; tell the class the procedures they followed in making a vehicle or a container with a hinged lid); CM, BW
- make simple mechanisms and use them in building a device they have designed (e.g., vehicle with wheels and axles); MD*
- select and use appropriate tools, utensils, and equipment (e.g., use a paper punch to make holes for the axle in cardboard wheels); All STC units
- use appropriate techniques to make and fasten the components of a model that they have made (e.g., bend cardboard to make hinges; glue various materials together). BW

Relating Science and Technology the World Outside the School

By the end of Grade 2, students will:

- identify, through observation, the mechanical parts of objects (e.g., hinges on doors) and describe the motion of these parts; BW
- compare the motion of objects on different surfaces (e.g., wheels of a toy on carpet, tile, and sand); MD*
- compare the motion of similar objects made with or filled with different materials (e.g., ways in which baseballs and tennis balls bounce; ways in which film canisters containing different materials roll down a slope); SL, BW
- describe, using their observations, the effect that different surfaces (e.g., wood, tiles, carpet, water) have on the rate at which an object slows down; MD*
- describe, using their observations, the effects of changing the slope of an inclined plane on the motion of an object that is placed on it (e.g., changes in speed, changes in distance traveled); MD*
- predict factors that make a load easier or more difficult to move (e.g., the size of a wheel or hinge, the amount of friction); MD*

- identify different ways in which wheels and axles can be attached to a chassis (e.g., by using an axle-holder, by placing the axle in holes drilled in the frame);
- demonstrate awareness that the wheels of a vehicle rotate clockwise or counterclockwise depending on the direction of movement of the vehicle.

Structures and Mechanisms: Grade 3 – Stability

Overall Expectations

By the end of Grade 3, students will:

- demonstrate an understanding of the factors that affect the stability of objects; SL, BW
- design and make structures that include mechanisms and that can support and move a load, and investigate the forces acting on them; describe, using their observations, systems involving mechanisms and structures, and explain how these systems meet specific needs and how they have been made. BW (in part), MD

Specific Expectations

Understanding Basic Concepts

By the end of Grade 3, students will:

- describe, using their observations, ways in which the strength of different materials can be altered (e.g., folding increases the strength of paper);
- describe ways in which forces alter the shape or strength of different structures (e.g., a load may cause a cardboard box to buckle);
- describe ways to improve the strength and stability of a frame structure (e.g., use of triangulation or a cross-member);
- describe, using their observations, the role of struts (e.g., to resist compression) and ties (e.g., to resist tension) in structures under load (e.g., describe the effect of adding a strut to a wooden frame);
- describe, using their observations, the changes in the amount of effort needed to lift a specific load with a lever when the position of the fulcrum is changed; BW
- describe, using their observations, how simple levers amplify or reduce movement (e.g., in operating the limbs of a puppet); BW
- describe the effects of different forces on specific structures and mechanisms (e.g., a structure collapses when the load is too heavy; a latch on a gate opens when pressed).

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 3, students will:

- ask questions about and identify needs and problems related to structures and mechanisms in their immediate environment, and explore possible answers and solutions (e.g., investigate the effects of folding on the shape and strength of materials); BW
- plan investigations to answer some of these questions or solve some of these problems, and explain the steps involved; BW
- use appropriate vocabulary to describe their investigations, explorations, and observations (e.g., use terms such as fulcrum, load, and effort when describing levers); BW

- record relevant observations, findings, and measurements, using written language, drawings, charts, and graphs (e.g., record the modifications they have made to increase the stability and strength of their structures); BW
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using demonstrations, drawings, simple media works, and oral and written descriptions (e.g., make a mobile that illustrates their discoveries about balance); BW
- design and make a stable structure that will support a given mass and perform a specific function (e.g., a bridge, a photo frame); BW
- use appropriate materials to strengthen and stabilize structures that they have designed and made and that are intended to support a load (e.g. use gussets, struts, ties, buttresses); BW
- design and make a levered mechanism (e.g., a model of an animal whose legs are moved with a lever); BW
- design and make a stable structure that contains a mechanism and performs a function that meets a specific need (e.g., a drawbridge, a crane); BW
- use appropriate equipment and adhesives when making structures that they have designed themselves (e.g., transparent tape for paper; low-temperature glue gun for wood); BW
- use hand tools (e.g., hand saws, scissors) and equipment (e.g., templates, miter boxes) appropriately to cut a variety of materials (e.g., wood, paper, cardboard, plastic). BW

Relating Science and Technology the World Outside the School

By the end of Grade 3, students will:

- distinguish between the structure of an object (e.g., the chassis of a vehicle) and its mechanical parts (e.g., the wheels and axles);
- recognize that geometrical patterns in a structure contribute to the strength and stability of that structure (e.g., a climbing frame);
- demonstrate awareness that the strength in structures is due to bulk (or mass), number of layers (e.g.; layers in particle board), and shape (e.g., triangulation);
- identify a number of common levers (e.g., crowbars, scissors, hammers, pliers, wheelbarrows, tweezers, tongs) and describe how they make work easier;
- identify efficient ways of joining the components of a mechanical structure or system (e.g., construct a right-angled corner; use an axle at a right angle to the frame); BW
- describe, using their observations, how different balance points of different masses affect the stability of a structure; BW
- predict which body positions provide the most stability in various circumstances (e.g., standing with legs apart, lying on the ground). BW

Structures and Mechanisms: Grade 4 – Pulleys and Gears

The STC curriculum does not deal with pulleys and gears. Instead, in the Motion and Design unit, students study how forces of various magnitudes affect the motion of objects of different masses. They also study some different ways that forces can be applied to objects. Students are then asked to design and build a wheeled vehicle that will meet certain specifications (e. g. move a given mass a given distance in a given time on either a flat or an inclined surface). The concept of force is explored further in Floating and Sinking, Measuring Time, and Magnets and Motors. Once the concept of force is firmly established, students will be able to apply it to the study of mechanical systems.

Structures and Mechanisms: Grade 5 – Forces Acting on Structures and Mechanisms

Overall Expectations

By the end of Grade 5, students will:

[Note: see also comments under Grade 4.]

- demonstrate an understanding of the effect of forces acting on different structures and mechanisms; MD, FS
- design and make load-bearing structures and different mechanisms, and investigate the forces acting on them; MD, FS
- evaluate the design of systems that include structures and mechanisms, and identify modifications to improve their effectiveness. MD, FS

Specific Expectations

Understanding Basic Concepts

By the end of Grade 5, students will:

- identify and measure forces acting on a structure (e.g., mass, air pressure), and describe the effects of their application; MD, FS
- identify the parts of a structure that are under tension and those that are under compression when subjected to a load (e.g., the wires in a suspension bridge are under tension; a ladder bearing a mass is under compression);
- compare the force needed to lift a load manually with the force required to lift the load with a simple machine (e.g., lever, pulley system, gear system);
- describe, using their observations, the advantages and disadvantages of using different types of mechanical systems (e.g., a single-pulley system has no mechanical advantage; a pulley system with two or more pulleys has a mechanical advantage);
- describe the turning force (torque) of different combinations of gears (e.g., the turning force of a higher gear and of a lower gear);
- identify the force required by different pulley systems (systems with one or more pulleys) to move a load, and compare the systems in qualitative terms.

Developing Skills in Inquiry, Design, and Communication

By the end of Grade 5, students will:

- formulate questions about and identify needs and problems related to structures and mechanisms in the outdoor environment, and explore possible answers and solutions (e.g., construct a bridge that must support a given load across a given distance; determine which surface of a cantilever bridge or beam is under tension and which is under compression); MD, FS
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; MD, FS
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as component, subsystem, and device when describing systems); MD, FS

- compile data gathered through investigation in order to record and present results, using tally charts, tables, and labelled graphs produced by hand or with a computer (e.g., make a chart to record data on the raising of a load with different pulley systems); MD, FS
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, written notes and descriptions, drawings, charts, and oral presentations (e.g., give a presentation on the process of designing and making a specific structure); design and make a frame structure that can support a load (e.g., a bridge); make a mechanical system that performs a specific function (e.g., lifting a heavy load; retrieving an object from a position that cannot be reached by hand); MD, FS
- cut, join, and rearrange pliable and rigid materials to make an object (e.g., cut wood at a 45° angle to make a miter joint; make a mould for a face mask); MD, FS
- describe safety measures to be taken to ensure their own safety and that of others (e.g., they need to check that fixed pulleys in pulley systems are secure before testing them). MD, FS

Relating Science and Technology the World Outside the School

By the end of Grade 5, students will:

- specific considerations in the actual manufacture of a product that they have designed and made (e.g., production time; cost and availability of materials); MD
- identify problems that arose in the designing and making of a product, and indicate how these could have been avoided or how they were solved; MD, MT, MM
- describe the consequences of having limited time and materials when making a product; MD
- identify modifications intended to improve the performance, aesthetic appeal, and impact on the environment of a product they designed; MD
- identify the aesthetic qualities of a product they made (e.g., form, colour, pattern, type of surface), and explain the usefulness of the product to others;
- assess the effect of modifying a component of a system (e.g., a personal computer system that has a keyboard, floppy disk drive, CD-ROM, hard drive, central processing unit, and monitor); MD
- assess the effect of modifying a subsystem that interacts with other subsystems within a system to perform a specific function (e.g., changing a pulley system to a lever system); MD
- describe how different mechanisms (e.g., ratchet and pawl, cam and cam follower) are designed for a specific purpose or function;
- recognize the advantages and disadvantages of using various mechanisms (e.g., levers, wheels and axles, pulleys, gears) with respect to the amount of energy they require to move or lift a given load;
- describe the change in energy transfer that occurs when the number and the size of gears in a gear system are modified.

Structures and Mechanisms: Grade 6 – Motion

Overall Expectations

By the end of Grade 6, students will:

- demonstrate an understanding of different kinds of motion (linear, rotational, reciprocating, oscillating); MD*, MT, MM
- design and make mechanical devices, and investigate how mechanisms change one type of motion into another and transfer energy from one form to another; MD*, MT, MM

- identify modifications to improve the design and method of production of systems that have mechanisms that move in different ways. MD*

Specific Expectations

Understanding Basic Concepts

By the end of Grade 6, students will:

- describe, using their observations, ways in which mechanical devices and systems produce a linear output from a rotary input (e.g., screw, crank and slider, rack and pinion, cam and cam follower); MT
- describe, using their observations, the purposes or uses of three classes of simple levers (e.g., wheelbarrow, tongs, seesaw);
- demonstrate an understanding of how linkages (systems of levers) transmit motion and force (e.g., by means of a fixed pivot, a moving pivot, and/or a fulcrum);
- demonstrate awareness that a moving mass has kinetic energy that can be transferred to a stationary object (e.g., a car hitting a wheelbarrow will cause the wheelbarrow to move);
- demonstrate awareness that friction (e.g., rubbing hands together) transforms kinetic energy into heat energy;
- investigate ways of reducing friction (e.g., use of ball bearings, lubricants) so that an object can be moved more easily. MD*

Developing Skills in Inquiry, Design, and Communication

By the end of Grade 6, students will:

- design and make mechanical devices that change the direction and speed of an input to produce a desired output and that perform a useful function (e.g., a clothesline); MD*, MT
- formulate questions about and identify needs and problems related to structures and mechanisms in the environment, and explore possible answers and solutions (e.g., describe how a system, such as a plumbing system, could be modified to meet different needs); MD*
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; MD*, MT
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as fulcrum, pivot, rack and pinion, belt); MD*, MT
- compile data gathered through investigation in order to record and present results, using tally charts, tables, labelled graphs, and scatter plots produced by hand or with a computer (e.g., measure and record the motion of moving objects; manipulate computerized data collected from a moving object); MD*, MT
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, written notes and descriptions, charts, drawings, and oral presentations (e.g., describe how a product was created from the first idea to the final model; produce a set of instructions to control the sequence of movements of a mechanical device). MD*, MT

Relating Science and Technology the World Outside the School

By the end of Grade 6, students will:

- make use of the physical and aesthetic properties of natural and manufactured materials when designing a product;
- show awareness of the effect on a design of the unavailability of specific materials (e.g., the design of a pair of scissors may need to change if only plastic is available instead of metal);
- write a plan outlining the different materials and processes involved in producing a product (e.g., resources, equipment, marketing); MD*
- identify various criteria for selecting a product (e.g., safety, reliability, durability);
- describe modifications that could improve the action of a variety of devices in the home (e.g., can opener, nutcracker, clothesline that uses pulleys);
- show an understanding of the impact of moving mechanisms (e.g., trucks, snowmobiles) on the environment and on living things (e.g., loss of natural habitat); E
- compare qualitatively the effort required to move a load a given distance using different devices and systems; MD*
- describe how different devices and systems have been used by different cultures to meet similar needs (e.g., irrigation systems for farms, temporary shelters, bicycles).

Earth and Space Systems: Grade 1 – Daily and Seasonal Cycles

Overall Expectations

By the end of Grade 1, students will:

- demonstrate an understanding of changes that occur in daily and seasonal cycles and of how these changes affect the characteristics, behavior, and location of living things; W
- investigate changes that occur in a daily cycle and in a seasonal cycle; W
- describe how living things, including humans, adapt to and prepare for daily and seasonal changes. W

Specific Expectations

Understanding Basic Concepts

By the end of Grade 1, students will:

- identify the sun as a source of heat and light; W
- compare the different characteristics of the four seasons (e.g., length of day, type of precipitation); W
- use units of time related to the earth's cycles (e.g., days, months, seasons); W
- describe, using their observations, changes in heat and light from the sun over a period of time (e.g., measure and describe outdoor temperature changes at different times of the day; observe and describe how the position of the sun influences the length and shape of shadows). W (in part)

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 1, students will:

- design and construct models of structures that would provide protection against local weather conditions (e.g., bus shelters, umbrellas, houses); W
- ask questions about and identify needs or problems arising from observable events in the environment, and explore possible answers and solutions (e.g., chart observations of a sunflower

over several days and identify a pattern in the movement of the head of the flower; record sunrise times and sunset times and observe a pattern); W

- plan investigations to answer some of these questions or solve some of these problems; W
- use appropriate vocabulary in describing their explorations, investigations, and observations (e.g., use words such as buds, flowers, seeds, and leaves to identify seasonal changes in plants); W
- record relevant observations, findings, and measurements, using written language, drawings, concrete materials, and charts (e.g., draw pictures of how animals live and what they do at different times of the year; measure and record changes in temperature); W
- communicate the procedures and results of explorations and investigations for specific purposes, using demonstrations, drawings, and oral and written descriptions (e.g., write and illustrate a booklet about their observations of seasonal changes; keep a journal recording and describing the weather for a given period of time). W

Relating Science and Technology to the World Outside the School

By the end of Grade 1, students will:

- identify outdoor human activities that are based on the seasons (e.g., swimming, gardening, skating) and examine some of the solutions humans have found to make it possible to engage in these activities out of season (e.g., community and sports centres make it possible to swim and skate in any season; greenhouses make it possible to garden in any season); W
- identify characteristics of clothing worn in different seasons and make appropriate decisions about clothing for different environmental conditions; W
- identify features of houses that help keep us sheltered and comfortable throughout daily and seasonal cycles (e.g., lights, furnaces); W
- describe changes in the characteristics and behavior of living things that occur on a daily basis (e.g., their own daily routines at school and at home, the behavior of nocturnal animals, changes in certain plants and flowers); describe changes in the characteristics, behavior, and location of living things that occur in seasonal cycles (e.g., trees shed their leaves, birds migrate); describe ways in which humans modify their behavior to adapt to changes in temperature and sunlight during the day (e.g., they put on extra clothing when it gets colder, they wear sunglasses). W

Earth and Space Systems: Grade 2 – Air and Water in the Environment

Overall Expectations

By the end of Grade 2, students will:

- demonstrate an awareness of the forms in which water and air are present in the environment, and describe ways in which living things are affected by water and air; W, C
- investigate the visible effects of air and water in the environment; W, LW*
- describe ways in which clean air and water are vital for meeting the needs of humans and other living things. E*

Specific Expectations

Understanding Basic Concepts

By the end of Grade 2, students will:

- demonstrate an awareness of air as a substance that surrounds us and takes up space, and whose movement we feel as wind; W, C
- describe the movement of air relying on their observations of its effects (e.g., tree branches swaying, clouds moving); W
- compare characteristics of and changes in observed air conditions, in both indoor and outdoor environments (e.g., cold winter temperatures outdoors and warm temperatures indoors); W
- identify ways in which changes in temperature affect living things, including themselves (e.g., decisions concerning activities or transportation; hibernation; dormancy; migration); W
- recognize that water exists in three states on earth (e.g., solid –visible as ice; liquid –visible as rain or as water in lakes, streams, etc.; gas –present but invisible as water vapor); W, SL, C
- identify and describe forms of moisture in the environment (e.g., dew, snow, fog, frost, rain); W
- identify the factors that cause things to dry quickly or slowly (e.g., air temperature; amount of moisture in the air; amount of wind);
- recognize evidence of the water cycle (e.g., observe water in a closed container and water in an open container; observe puddles evaporating after a rainstorm). W, C

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 2, students will:

- ask questions about and identify needs or problems arising from events in the outdoor environment, and explore possible answers and solutions (e.g., observe that there is a relationship between the patterns and movement of clouds and changes in weather; monitor the length of time needed for various materials used for clothing to dry in order to determine which materials are more suitable for wet weather); W
- plan investigations to answer some of these questions or solve some of these problems, and describe the steps involved; W
- use appropriate vocabulary in describing their explorations, investigations, and observations (e.g., use words such as solid, liquid, vapour; use the correct terms to describe quantities of water in standard (metric) and non-standard units of measure); W, SL, C
- record relevant observations, findings, and measurements, using written language, drawings, concrete materials, and charts (e.g., record and graph weather data gathered over a period of a few weeks); W, SL, C
- communicate the procedures and results of explorations and investigations for specific purposes, using drawings, demonstrations, and oral and written descriptions (e.g., write the instructions for constructing a pinwheel, adding helpful drawings or diagrams). W, SL, C

Relating Science and Technology to the World Outside the School

By the end of Grade 2, students will:

- predict and describe how local weather conditions affect living things, including themselves (e.g., effect of wind on trees in autumn, effect of snowfall on humans' ability to travel); W

- describe the different uses of water and identify some that are essential for maintaining our health (e.g., water is used for drinking and washing; clean drinking water is essential for the health of humans); W, C, LW*
- identify sources of drinking water (e.g., wells, springs, Great Lakes, rivers); LW*
- recognize that clean water is an increasingly scarce resource in many parts of the world and that the water we use is part of our environment and should be used wisely (e.g., taps should be turned off while brushing teeth; toxic substances such as paint should not be poured down the drain); E*
- demonstrate awareness of the ways in which the disposal of waste water can affect our health and the health of other living things (e.g., pouring waste water containing chemicals into a lake or river can seriously harm people and the organisms that live in the water). E*

Earth and Space Systems: Grade 3 – Soils in the Environment

Overall Expectations

By the end of Grade 3, students will:

- demonstrate an understanding of the similarities and differences between various soils and the effects of moving water on soils; investigate the components of various soils, and describe the effects of moving water on these soils; S
- recognize the dependence of humans and other living things on soil and recognize its importance as a source of materials for making useful objects. S, PGD, RM

Specific Expectations

Understanding Basic Concepts

By the end of Grade 3, students will:

- describe, using their observations, the various components within a sample of soil (e.g., pebbles, decaying plants); S
- describe, using their observations, the differences between sand, clay, humus, and other soil components (e.g., texture, smell, malleability), and compare and describe soil samples from different locations (e.g., school yard, forest, marsh, beach); S
- compare the absorption of water by different earth materials, and describe the effects of moisture on characteristics of the materials (e.g., on texture, coherence, ability to hold a shape); S
- describe, using their observations, how different earth materials (e.g., rocks, pebbles, sand) are affected by moving water (e.g., the sand on a beach washed by waves; pebbles in a river); S, LW*
- compare different ways in which plant roots (e.g., fibrous roots, tap roots) grow through the soil; S
- describe through experimentation how soil can be separated into its different components (e.g., sieving, sedimentation). S

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 3, students will:

- ask questions about organisms and events in the outdoor environment and identify needs of organisms that arise from these events, and explore possible answers to these questions and

ways of meeting these needs (e.g., investigate the different effects produced when water is sprayed on and poured on exposed soil, asphalt, and grass); S

- plan investigations to answer some of these questions or find ways of meeting these needs, and explain the steps involved; S
- use appropriate vocabulary in describing their investigations, explorations, and observations (e.g., use terms such as clay, sand, and pebbles to describe the earth materials in soil); S
- record relevant observations, findings, and measurements, using written language, charts, and drawings (e.g., create a tally chart to record the water absorption of different earth materials); S
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using drawings, demonstrations, simple media works, and oral and written descriptions (e.g., record what happens when soil and water are shaken together in a container; prepare a display comparing the composition of soils from different locations). S

Relating Science and Technology to the World Outside the School

By the end of Grade 3, students will:

- identify living things found in the soil (e.g., roots, earthworms, larvae); S
- demonstrate awareness of the importance of recycling organic materials in soils (e.g., explain the purpose of a compost heap; explain the reason why it is useful to leave grass clippings on the lawn); S
- recognize the importance of understanding different types of soil and their characteristics (e.g., enables people to determine which crops can be grown in a particular area; enables gardeners and farmers to improve plant growth); S
- describe how the use of different soils affects the growth of indoor plants; S
- describe ways of using soil materials to make useful objects, and investigate, through manipulation, ways of shaping clay to make useful objects (e.g., model bricks or beads).

Earth and Space Systems: Grade 4 – Rocks, Minerals, and Erosion

Overall Expectations

By the end of Grade 4, students will:

- demonstrate an understanding of the physical properties of rocks and minerals and the effects of erosion on the landscape; RM, LW
- investigate, test, and compare the physical properties of rocks and minerals and investigate the factors that cause erosion of the landscape; RM, LW
- describe the effects of human activity (e.g., land development, building of dams, mine development, erosion-preventing measures) on physical features of the landscape, and examine the use of rocks and minerals in making consumer products. RM, LW

Specific Expectations

Understanding Basic Concepts

By the end of Grade 4, students will:

- describe the difference between minerals (composed of the same substance throughout) and rocks (composed of two or more minerals); RM

- classify rocks and minerals according to chosen criteria, relying on their observations (e.g., color, texture, shape); RM
- recognize that there are three classes of rocks: igneous, sedimentary, and metamorphic; RM
- compare different rocks and minerals from the local environment with rocks and minerals from other places; RM
- describe the effects of wind, water, and ice on the landscape (e.g., ice breaking rocks into soil), and identify natural phenomena that cause rapid and significant changes in the landscape (e.g., floods, tornadoes, heavy rainstorms); LW
- investigate and describe ways in which soil is formed from rocks; RM, LW
- identify and describe rocks that contain records of the earth's history (e.g., fossils), and explain how they were formed. RM

Developing Skills of Inquiry Design, and Communication

By the end of Grade 4, students will:

- follow procedures that ensure their safety by covering rock samples with a cloth when chipping and by wearing safety goggles; Students do not chip rock samples in RM
- test and compare the physical properties of minerals (e.g., scratch test for hardness, streak test for colour); RM
- formulate questions about and identify needs and problems related to objects and events in the environment, and explore possible answers and solutions (e.g., create a mould of a fossil and use the mould to make a replica of the fossil to demonstrate how the fossil was formed; design and carry out an investigation using sand structures to show the relationship between volume of water and erosion); RM, LW
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; LW
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as hardness, colour, lustre, and texture when discussing the physical properties of rocks and minerals); RM
- compile data gathered through investigation in order to record and present results, using tally charts, tables, and labelled graphs produced by hand or with a computer (e.g., use a chart to record findings obtained through a mineral hardness test); RM, LW
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, drawings, and charts (e.g., put together a labelled exhibit of rocks found in the local environment; create a chart of the physical characteristics of different types of rocks and minerals). RM, LW

Relating Science and Technology to the World Outside the School

By the end of Grade 4, students will:

- distinguish between natural features of the landscape and those that are the result of human activity (e.g., Niagara Escarpment, farm land, vineyards); LW
- determine positive and negative effects of human alteration of the landscape (e.g., use of farm land for housing developments; use of wilderness areas for cultivation of crops; creation of parks); LW, E

- identify ways in which soil erosion can be controlled or minimized (e.g., by planting trees, by building retaining walls), and create a plan for reducing erosion of soil in a local field or plot; LW
- design, build, and test a system to control the effects of soil erosion; LW
- identify the many uses of rocks and minerals in manufacturing, and in arts and crafts (e.g., china, iron fences, soapstone carvings, jewellery, coins); RM
- conduct their investigations of the outdoor environment in a responsible way and with respect for the environment (e.g., leave the site of the investigation as they found it, putting back objects examined where they found them and taking away all equipment brought to the site).
Compatible with all STC units

Earth and Space Systems: Grade 5 – Weather

Overall Expectations

By the end of Grade 5, students will:

- demonstrate an understanding of the major climatic factors and patterns associated with weather;
- investigate the major climatic factors associated with weather, and design, construct, and test a variety of instruments for recording various features of the weather how weather forecasts influence decisions concerning human activity and how humans have adapted to a variety of weather conditions.

Specific Expectations

Understanding Basic Concepts

By the end of Grade 5, students will:

- explain the difference between weather and climate and the factors that influence both of these systems (e.g., temperature, moisture, wind, air pressure, the sun);
- recognize large-scale and local weather systems (e.g., fronts, air masses, storms);
- predict local weather patterns using data from their own observations of weather and from weather reports;
- explain the formation of clouds and the effects of different cloud formations on weather and climate (e.g., create a model of a cloud in a jar and relate it to the water cycle; describe the relationship between the formation of cumulonimbus clouds and thunderstorms); LW
- describe the water cycle in terms of evaporation, condensation, and precipitation; LW
- identify patterns in air movement (e.g., low pressure and high pressure);
- describe the ways in which energy from the sun affects weather conditions (e.g., evaporation of water results in condensation, which in turn results in precipitation); LW, E
- identify the effects of air pressure (e.g., low pressure air masses are associated with mild temperature and create conditions that cause storms or clouds; high pressure air masses are cooler and are often associated with clear weather conditions);
- compare outdoor air movement with indoor air movement (e.g., as hot air rises, cold air takes its place; the warmest rooms in a house are usually the upstairs bedrooms).

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 5, the student will:

- design, construct, and test a variety of weather instruments (e.g., weather vane, anemometer, rain gauge, wind sock, hygrometer);
- formulate questions about and identify needs and problems related to objects and events in the environment, and explore possible answers and solutions (e.g., test a variety of fabrics for their waterproofing or insulating properties); W*, E
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; E
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as temperature, precipitation, humidity, wind chill factor, barometric pressure, and cloud cover);
- compile data gathered through investigation in order to record and present results, using tally charts, tables, and labelled graphs produced by hand or with a computer (e.g., record both qualitative and quantitative data from observations of weather over a period of time; accurately use a thermometer to read temperature and record the results); W*
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, drawings, and charts (e.g., draw a labelled diagram of the water cycle).

Relating Science and Technology the World Outside the School

By the end of Grade 5, the student will:

- describe ways in which weather conditions affect the activities of humans and other animals (e.g., people refrain from strenuous physical activity in extreme heat; farmers plant crops when the soil is moist; animals hibernate in extreme cold); AS
- explain how climatic and weather conditions influence the choice of materials used for building shelters (e.g., bricks are often used for building in cold climates, stone and marble in warmer climates);
- explain how advances in technology and science have enabled humans to make predictions about the weather (e.g., microwave beams are used to reflect cloud cover; satellite images of the earth allow us to track weather patterns on a larger scale than was previously possible);
- understand and explain the importance of weather forecasts for people in certain occupations (e.g., farmers, pilots);
- recognize how the movement of large-scale air masses affects regional weather in Ontario (e.g., high pressure systems from the Arctic are associated with clear and cool weather; Atlantic systems are associated with cloudy skies; Pacific systems are associated with a variety of different weather conditions);
- explain how weather conditions influence activities and events related to science and technology (e.g., launching the space shuttle).

Earth and Space Systems: Grade 6 – Space

Overall Expectations

By the end of Grade 6, students will:

- demonstrate an understanding of the patterns of change observable on earth as a result of the movement of the different bodies in the solar system (e.g., solar and lunar eclipses, tides, phases of the moon, position of the constellations) and of the physical characteristics of the different components of the solar system; MT (in part)

- investigate, using models and simulations, the relationship between the sun, earth, and moon, the patterns of change observable on earth that result from the movement of these bodies, and the physical characteristics of the different components of the solar system (e.g., the sun and planets, inner planets and outer planets); MT (in part)
- describe technological and scientific advances that enable humans to study space, and explain how these advances have affected the quality of life on earth.

Specific Expectations

Understanding Basic Concepts

By the end of Grade 6, students will:

- describe the physical characteristics of components of the solar system –the sun, planets, natural satellites, comets, asteroids, and meteoroids (e.g., relative size, surface temperature);
- identify the bodies in space that emit light (stars) and those that reflect light (e.g., moons, planets); MT
- describe, using models or simulations, the features of the moon's surface (e.g., craters, maria, rills);
- identify cycles in nature (e.g., cycle of day and night, cycle of seasons) and describe the changes within the cycles (e.g., observe the phases of the moon over several months to determine the pattern of change, and record these observations);MT
- describe, using models or simulations, how the earth's rotation causes the cycle of day and night, and how the earth's revolution causes the cycle of the seasons;
- recognize major constellations visible at night and describe the origins of their names (e.g., Orion, Leo);
- describe, using models or simulations, the effects of the relative motion and positions of the earth, moon, and sun (e.g., solar and lunar eclipses, tides, phases of the moon); MT
- follow safety procedures when observing the sun (e.g., never look at the sun directly or through a lens or colored glass; look only at a projection of the sun's image; do not use a lens or magnifier to focus the sun's rays to a small area; exercise caution when using mirrors so that they do not reflect the sun's image directly into someone's eyes). MT

Developing Skills of Inquiry, Design, and Communication

By the end of Grade 6, students will:

- construct a device that could have been used to tell time before mechanical clocks were invented (e.g., sundial); MT
- formulate questions about and identify needs and problems related to objects and events in the environment, and explore possible answers and solutions (e.g., investigate why craters are of different sizes; use print, media, and electronic resources to identify and investigate space technologies and to investigate images of space and identify what they represent; use a computer simulation program to show the relative size of the planets and their distance from the sun); MT
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions; use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as constellations, planets, moons, comets, asteroids, and meteors to describe objects in space); MT

- compile data gathered through investigation in order to record and present results, using tally charts, tables, labelled graphs, and scatter plots produced by hand or with a computer (e.g., use print and electronic resources to organize information about the solar system); MT
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, written notes and descriptions, charts, graphs, drawings, and oral presentations (e.g., prepare a multimedia presentation showing Canada's contribution to space exploration). MT

Relating Science and Technology to the World Outside the School

By the end of Grade 6, students will:

- describe how humans have improved the tools and techniques used in space exploration (e.g., Canadarm, Hubble telescope, Lunar Rover, Sojourner);
- identify Canadians who have contributed to space science and technology (e.g., Marc Garneau, Roberta Bondar, Chris Hatfield, David Levy, Helen Hogg, Bjarni Tryggvason);
- explain how astronauts meet their basic needs in space (e.g., through the use of dehydrated foods, backpacks with an oxygen supply, a hermetically sealed cabin with temperature and air controls);
- identify the technological tools and devices needed for space exploration (e.g., telescopes, spectrometers, spacecraft, life support systems);
- recognize problems arising from space exploration (e.g., space junk, satellites burning in the atmosphere upon re-entry);
- identify and describe past and present-day contributions of astronomy to the quality of human life (e.g., development of the calendar; prediction of events such as eclipses and seasons; provision of information about space and time); MT
- identify the ways in which the development of materials and technology for space exploration has led to the use of new technologies and materials on earth (e.g., micro-electronics, medical imaging, remote sensing).