



# Québec Education Program

## Progression of Learning

Science and Technology

Elementary Cycle Three

2021-2022 School Year

Learning to Be Prioritized for the 2021-2022 School  
Year in the Context of the Pandemic

This document is identical to the one  
produced for the 2020-2021 school year.

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## Introduction

This document is complementary to the Science and Technology program. It aims to provide information on the knowledge and skills students must acquire for each year of elementary school. It is intended to help teachers with their lesson planning. The document includes tables outlining the knowledge related to the categories *Material World*, *Earth and Space* and *Living Things*, as well as Exploration Strategies, Strategies for Recording, Using and Interpreting Information and Communication Strategies. The nature and scope of this knowledge is further clarified by a list of statements indicating the degree of complexity of the subject matter at the elementary school level.

Given the vast range of knowledge in question, it is recommended that the focus be on the statements that appear in bold. For the most part, these statements were selected because they are interrelated and provide a well-balanced knowledge base within each category. This knowledge will enable students to construct their representation of the world and develop their scientific and technological literacy.

As early as kindergarten, children begin showing an interest in science and technology<sup>1</sup> by expressing curiosity about the world around them. During the first cycle of elementary school, students explore scientific and technological activity through the other subjects and the broad areas of learning. The knowledge to be acquired is often based on their immediate environment and involves simple and usually observable phenomena. In this way, the students begin developing their scientific and technological literacy and continue to do so throughout their studies. During the second and third cycles, teachers present concrete and meaningful activities that encourage children to be inquisitive and raise questions. The problems addressed in discussing these questions often guide the teacher in choosing the knowledge that will be covered in class.

By appropriately using the knowledge listed in this document, the students will develop the competencies outlined in the Science and Technology program. In order *to propose explanations for or solutions to scientific or technological problems*, students must become familiar with strategies and acquire conceptual and technical knowledge that will enable them to understand and explore the problem and then justify their choices. In addition, in order *to make the most of scientific and technological tools, objects and procedures*, they must apply the knowledge needed to use tools, design various objects and evaluate their use and impact. Finally, in order *to communicate in the languages used in science and technology*, they must have the knowledge that will enable them to interpret and convey messages by proficiently using the languages and types of representations associated with this subject.

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1. In this document, the term *technology* encompasses a wide variety of achievements, which include techniques, processes, tools, machines and materials.

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a. <b>Demonstrates that physical changes</b> (e.g. deforming, breaking, grinding, phase changes) <b>do not change the properties of matter</b>			→	★		
b. <b>Demonstrates that chemical changes</b> (e.g. cooking, combustion, oxidation, acid-base reactions) <b>change the properties of matter</b>					→	★
c. Explains how certain household products are made (e.g. soap, paper) <sup>1</sup>			→	→	→	★
6. Common household products						
a. Associates the uses of certain household products with their properties (e.g. cleaning products remove grease, vinegar and lemon juice help preserve certain foods)	→	★				
b. <b>Recognizes commonly used products that are potentially dangerous (safety-related symbols)</b>	→	★				
<b>B. Energy</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. <b>Forms of energy</b>						
a. <b>Describes different forms of energy</b> (mechanical, electrical, light, chemical, heat, sound, nuclear)			→	★		
b. <b>Identifies sources of energy in his/her environment</b> (e.g. moving water, chemical reaction in a battery, sunlight)			→	→	→	★
2. <b>Transmission of energy</b>						
a. Distinguishes between substances that are thermal conductors and those that are thermal insulators					→	★
b. <b>Distinguishes between substances that are electrical conductors and those that are electrical insulators</b>					→	★
c. <b>Identifies the components of a simple electric circuit</b> (wire, source, light bulb, switch)					→	★
d. <b>Describes the functions of the components of a simple electric circuit</b> (conductor, insulator, energy source, light bulb, switch)					→	★
e. Identifies the characteristics of a sound wave (e.g. volume, timbre, echo)			→	★		
f. Describes the behaviour of light rays (reflection, refraction)					→	★
g. Explains the motion of convection in liquids and gases (e.g. boiling water)			→	★		
3. <b>Transformation of energy</b>						
a. Describes situations in which human beings consume energy (e.g. heating, transportation, food consumption, recreation)			→	→	→	★
b. Names means used by human beings to limit their energy consumption (e.g. fluorescent light bulbs, timers) and to conserve energy (e.g. insulation)			→	★		
c. Explains the insulating properties of various substances (e.g. polystyrene, mineral wool, straw)					→	★
d. <b>Describes the transformations of energy from one form to another</b>			→	★		
e. <b>Recognizes the transformations of energy from one form to another in various devices</b> (e.g. flashlight: chemical to light; electric kettle: electrical to heat)					→	★
<b>C. Forces and motion</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Electrostatic						
a. Describes the effect of electrostatic attraction (e.g. paper attracted by a charged object)			→	★		
2. Magnetism and electromagnetism						
a. <b>Recognizes the effects of magnetism on magnets (attraction and repulsion)</b>	→	★				
b. Identifies situations in which magnets are used	→	★				
c. Distinguishes between a magnet and an electromagnet					→	★
d. Identifies objects that use the principles of electromagnetism (e.g. electromagnetic crane, fire door)					→	★
3. Gravitational attraction on an object						

a. Describes the effect of gravitational attraction on an object (e.g. free fall)					→	★
4. Pressure						
a. Recognizes various manifestations of pressure (e.g. inflatable balloon, atmospheric pressure, airplane wing)					→	★
b. Describes the effects of pressure on an object (e.g. compression, displacement, increase in temperature)					→	★
5. Characteristics of motion						
a. Describes the characteristics of motion (e.g. direction, speed)			→	★		
6. Effects of a force on the direction of an object						
a. Identifies situations involving the force of friction (pushing on an object, sliding an object, rolling an object)	→	★				
b. Identifies examples of a force (e.g. pulling, pushing, throwing, squeezing, stretching)			→	★		
c. Describes the effects of a force on an object (e.g. Sets it in motion, changes its motion, stops it)			→	★		
d. Describes the effects of a force on a material or structure			→	★		
7. Combined effects of several forces on an object						
a. Predicts the combined effect of several forces on an object at rest or an object moving in a straight line (e.g. reinforcement, opposition)					→	★
<b>D. Systems and interaction</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Everyday technical objects						
a. Describes the parts and mechanisms that make up an object	→	★				
b. Identifies the needs that an object was originally designed to meet	→	★				
2. Simple machines						
a. <b>Recognizes simple machines (lever, inclined plane, screw, pulley, winch, wheel) used in an object</b> (e.g. lever in seesaw, inclined plane for an access ramp)			→	★		
b. <b>Describes the uses of certain simple machines</b> (to adjust the force required)			→	★		
3. Other machines						
a. Identifies the main function of some complex machines (e.g. cart, waterwheel, wind turbine)					→	★
4. How manufactured objects work						
a. <b>Identifies the mechanical parts (e.g. gears, cams, springs, simple machines, connecting rods)</b>			→	→	→	★
b. <b>Recognizes two types of motion (rotation and translation)</b>			→	→	→	★
c. <b>Describes a simple sequence of mechanical parts in motion</b>			→	→	→	★
5. Servomechanism and robots						
a. Recognizes robotic structures that use a servomechanism					→	★
6. Transportation technology (e.g. car, airplane, boat)						
a. Recognizes the influence and impact of transportation technology on people's way of life and surroundings			→	→	→	★
7. Electron technology						
a. Recognizes the influence and the impact of electric appliances on people's way of life and surroundings (e.g. telephone, radio, television, computer)			→	→	→	★
<b>E. Techniques and instrumentation</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>

1. Use of simple measuring instruments						
a.	Appropriately uses simple measuring instruments (rulers, dropper, graduated cylinder, balance, thermometer, chronometer)			→	→	→ ★
2. Use of simple machines						
a.	Appropriately uses simple machines (lever, inclined plane, screw, pulley, winch, wheel)			→	→	→ ★
3. Use of tools						
a.	Appropriately and safely uses tools (e.g. pliers, screwdriver, hammer, wrench, simple template)			→	→	→ ★
4. Design and manufacture of instruments, tools, machines, structures (e.g. bridges, towers), devices (e.g. water filtration device), models (e.g. glider) and simple circuits						
a.	Knows the symbols associated with types of motion, electrical components and mechanical parts			→	→	→ ★
b.	Interprets a diagram or a plan containing symbols			→	→	→ ★
c.	Uses symbols associated with mechanical parts and electrical components in a diagram or drawing			→	→	→ ★
d.	Draws and cuts parts out of various materials using appropriate tools			→	→	→ ★
e.	Uses appropriate assembling methods (e.g. screws, glue, nails, tacks, nuts)			→	→	→ ★
f.	Uses appropriate tools for proper finishing work			→	→	→ ★
g.	Uses simple machines, mechanisms or electrical components to design or make an object			→	→	→ ★
<b>F. Appropriate language</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5 6</b>
1. Terminology related to an understanding of the material world						
a.	Appropriately uses terminology related to the material world			→	→	→ → → ★
b.	Distinguishes between the meaning of a term used in a scientific or technological context and its meaning in everyday language (e.g. source, matter, body, energy, machine)			→	→	→ → → ★
2. Conventions and types of representations specific to the concepts studied						
a.	Communicates using appropriate types of representations that reflect the rules and conventions of science and technology (e.g. symbols, graphs, tables, drawings, sketches, norms and standardization)			→	→	→ ★

1. Teachers on the school team should work together with regard to the statements that apply to both the second and third cycles. This knowledge should be called upon during various tasks and the level of complexity should be increased from one cycle to the next.

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c. <b>Describes the methods invented by humans to transform renewable sources of energy into electricity (hydroelectric dam, wind turbine, solar panels)</b>				→	★		
d. <b>Describes what nonrenewable energy is</b>						→	★
e. <b>Explains that fossil fuels are nonrenewable sources of energy</b>						→	★
f. <b>Names fuels derived from petroleum</b> (e.g. gasoline, propane, butane, fuel oil, natural gas)						→	★
<b>C. Forces and motion</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	
1. Rotation of the Earth							
a. <b>Associates the cycle of day and night with the rotation of the Earth</b>				→	★		
2. The tides							
a. Describes the ebb and flow of the tides (rise and fall of sea levels)						→	★
<b>D. Systems and interaction</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	
1. Light and shadow							
a. <b>Describes the influence of the apparent position of the sun on the length of shadows</b>			→	★			
2. System involving the sun, the Earth and the moon							
a. <b>Associates the sun with the idea of a star, the Earth with the idea of a planet and the moon with the idea a natural satellite</b>			→	★			
b. Describes the rotational and revolutionary motion of the Earth and the moon				→	★		
c. Illustrates the phases of the lunar cycle (full moon, new moon, first and last quarters)				→	★		
d. Illustrates the formation of eclipses (lunar, solar)				→	★		
3. <b>Solar system</b>							
a. <b>Recognizes the main components of the solar system (sun, planets, natural satellites)</b>						→	★
b. Describes the characteristics of the main components of the solar system (e.g. composition, size, orbit, temperature)						→	★
4. <b>Seasons</b>							
a. <b>Describes the changes to the environment throughout the seasons (temperature, amount of daylight, type of precipitation)</b>			→	★			
b. Explains the sensations experienced (hot, cold, comfortable) with regard to temperature measurements			→	★			
c. <b>Associates the changing of the seasons with the revolution and tilt of the Earth</b>						→	★
5. <b>Stars and the Galaxies</b>							
a. Recognizes the stars and the constellations on a map of the stars				→	★		
b. <b>Distinguishes between stars, constellations and galaxies</b>						→	★
6. Meteorological systems and climates							
a. Makes connections between weather conditions and the types of clouds in the sky				→	★		
b. Associates the average amount of precipitation with the climate of a region (dry, humid)						→	★
c. Associates the average temperature with the climate of a region (polar, cold, temperate, mild, hot)						→	★
7. Technologies related to the Earth, the atmosphere and outer space							

a. Recognizes the influence and the impact of technologies related to the Earth, the atmosphere and outer space on people's way of life and surroundings (e.g. prospecting equipment, meteorological instruments, seismograph, telescope, satellite, space station)			→	→	→	★
<b>E. Techniques and instrumentation</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Use of simple observational instruments						
a. Appropriately uses simple observational instruments (e.g. magnifying glass, binoculars)			→	→	→	★
2. Use of simple measuring instruments						
a. Appropriately uses simple measuring instruments (e.g. rulers, dropper, graduated cylinder, balance, thermometer, wind vane, barometer, anemometer, hygrometer)			→	→	→	★
3. Design and manufacture of measuring instruments and prototypes						
a. Designs and manufactures measuring instruments and prototypes <sup>1</sup>			→	→	→	★
<b>F. Appropriate language</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Terminology related to an understanding of the Earth and the universe						
a. Appropriately uses terminology related to an understanding of the Earth and the universe	→	→	→	→	→	★
b. Distinguishes between the meaning of a term used in a scientific or technological context and its meaning in everyday language (e.g. space, revolution)	→	→	→	→	→	★
2. Conventions and types of representations specific to the concepts studied						
a. Communicates using appropriate types of representations that reflect the rules and conventions of science and technology (e.g. symbols, graphs, tables, drawings, sketches)			→	→	→	★

1. Refer to the statements under *Design and manufacture of instruments, tools, machines, structures, devices, models and simple electric circuits* in the *Material World* section.

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B. Energy	1	2	3	4	5	6
1. Sources of energy for living things						
a. Compares the nutrition of domestic animals with that of wild animals	→	★				
b. <b>Explains the nutritional needs common to all animals (water, sugars, lipids, proteins, vitamins, minerals)</b>			→	★		
c. Associates familiar animals with their diet (carnivorous, herbivorous, omnivorous)			→	★		
d. <b>Describes how photosynthesis works</b>					→	★
e. <b>Distinguishes between photosynthesis and respiration</b>					→	★
f. <b>Explains how water, light, mineral salts and carbon dioxide are essential to plants</b>					→	★
g. Describes agricultural and food technologies (e.g. crossbreeding of plants and their propagation by cuttings, selection and breeding of animals, food production, pasteurization)			→	→	→	★
2. Transformation of energy in living things						
a. Illustrates a simple food chain (3 or 4 links)			→	★		
b. Describes an ecological pyramid of a given environment					→	★
C. Forces and motion	1	2	3	4	5	6
1. How animals move						
a. <b>Describes the different ways animals move (walking, creeping, flying, jumping)</b>			→	★		
b. Names other ways animals move and why (e.g. defence, mating ritual)			→	★		
2. Motion in plants						
a. <b>Distinguishes among the three types of motion in plants (geotropism, hydrotropism, phototropism)</b>					→	★
b. Explains how the types of motion in plants enable them to meet their basic needs					→	★
D. Systems and interaction	1	2	3	4	5	6
1. Interaction between living organisms and their environment						
a. <b>Describes the physical characteristics that demonstrate how animals adapt to their environment</b>	→	★				
b. <b>Describes the behaviours of familiar animals that enable them to adapt to their environment</b>	→	★				
c. Identifies habitats and the animal and plant populations found in them			→	★		
d. Describes how animals meet their basic needs within their habitat			→	★		
e. Describes relationships between living things (parasitism, predation)			→	★		
f. Explains how animals and plants adapt to increase their chances of survival (e.g. mimicry, camouflage)			→	★		
2. Use of living things for consumption						
a. <b>Provides examples of how living things are used (e.g. meat, vegetable, wood, leather)</b>	→	★				
3. <b>Interaction between humans and their environment</b>						
a. <b>Describes the impact of human activity on the environment (e.g. use of resources, pollution, waste management, land use, urbanization, agriculture)</b>			→	→	→	★
4. Food production techniques						
a. Describes the main steps in the production of various basic foods (e.g. making butter, bread, yogurt)	→	★				

5. Environmental technologies						
a. Explains the scientific and technological concepts associated with recycling and composting (e.g. properties of matter, phase changes, physical changes, chemical changes, food chain, energy)			→	→	→	★
<b>E. Techniques and instrumentation</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Use of simple observational instruments						
a. Appropriately uses simple observational instruments (e.g. magnifying glass, binoculars)			→	→	→	★
2. Use of simple measuring instruments						
a. Appropriately uses simple measuring instruments (e.g. rulers, dropper, graduated cylinder, balance, thermometer)			→	→	→	★
3. Design and manufacture of environments						
a. Designs and manufactures environments <sup>1</sup> (e.g. aquarium, terrarium, incubator, greenhouse)			→	→	→	★
<b>F. Appropriate language</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Terminology related to an understanding of living things						
a. Appropriately uses terminology related to an understanding of living things	→	→	→	→	→	★
b. Distinguishes between the meaning of a term used in a scientific or technological context and its meaning in everyday language (e.g. habitat, metamorphosis)	→	→	→	→	→	★
2. Conventions and types of representations specific to the concepts studied						
a. Communicates using appropriate types of representations that reflect the rules and conventions of science and technology (e.g. symbols, graphs, tables, drawings, sketches)			→	→	→	★

1. Refer to the statements under *Design and manufacture of instruments, tools, machines, structures, devices, models and simple electric circuits* in the *Material World* section.

## Strategies

The strategies listed below are fundamental to the approaches used in science and technology. Whereas certain strategies apply at every step in the student's work (e.g. using different types of reasoning, exchanging information), others are used at different stages (e.g. becoming aware of his or her previous representations, using different tools for recording information). It is recommended that students start using strategies in the first cycle of elementary school.

Exploration strategies
<ul style="list-style-type: none"><li>■ Studying a problem or a phenomenon from different points of view (e.g. social, environmental, historical, economic perspectives)</li><li>■ Distinguishing between the different types of information useful for solving the problem</li><li>■ Recalling similar problems that have already been solved</li><li>■ Becoming aware of his or her previous representations</li><li>■ Drawing a diagram for the problem or illustrating it</li><li>■ Formulating questions</li><li>■ Putting forward hypotheses (e.g. individually, as a team, as a class)</li><li>■ Exploring various ways of solving the problem</li><li>■ Anticipating the results of his or her approach</li><li>■ Imagining solutions to a problem in light of his or her explanations</li><li>■ Taking into account the constraints involved in solving a problem or making an object (e.g. specifications, available resources, time allotted)</li><li>■ Examining his or her mistakes in order to identify their source</li><li>■ Using different types of reasoning (e.g. induction, deduction, inference, comparison, classification)</li><li>■ Using empirical approaches (e.g. trial and error, analysis, exploration using one's senses)</li></ul>
Strategies for recording, using and interpreting information
<ul style="list-style-type: none"><li>■ Using different sources of information (e.g. books, newspapers, Web sites, magazines, experts)</li><li>■ Validating sources of information</li><li>■ Using a variety of observational techniques and tools</li><li>■ Using technical design to illustrate a solution (e.g. diagrams, sketches, technical drawings)</li><li>■ Using different tools for recording information (e.g. diagrams, graphs, procedures, notebooks, logbook)</li></ul>
Communication strategies
<ul style="list-style-type: none"><li>■ Using different means of communication to propose explanations or solutions (e.g. oral presentation, written presentation, procedure)</li><li>■ Using tools to display information in tables and graphs or to draw a diagram</li><li>■ Organizing information for a presentation (e.g. tables, diagrams, graphs)</li><li>■ Exchanging information</li><li>■ Comparing different possible explanations for or solutions to a problem in order to assess them (e.g. full-group discussion)</li></ul>