



Competencies and Characteristics

Science and Technology

Cycle 2
2001-2002

Extracted from
The Québec Education Program

Bob Steele
The Lester B. Pearson School Board

COMPETENCY 1 • TO PROPOSE EXPLANATIONS FOR OR SOLUTIONS TO SCIENTIFIC OR TECHNOLOGICAL PROBLEMS				
	Evaluation Criteria			
	Appropriate description of the problem or set of problems from a scientific or technological point of view			
	Use of an approach geared to the nature of the problem or set of problems			
	Development of relevant explanations or realistic solutions			
	Justification of explanations or solutions			
COMPETENCY 2 • TO MAKE THE MOST OF SCIENTIFIC AND TECHNOLOGICAL TOOLS, OBJECTS AND PROCEDURES				
	Evaluation Criteria			
	Association of instruments, tools and techniques with appropriate uses			
	Appropriate use of instruments, tools or techniques			
	Design and making of instruments, tools or models			
	Identification of the effects of using various tools, instruments or procedures			
COMPETENCY 3 • TO COMMUNICATE IN THE LANGUAGES USED IN SCIENCE AND TECHNOLOGY				
	Evaluation Criteria			
	Understanding of scientific and technological information			
	Correct transmission of scientific and technological information			
Essential Knowledges				
	MATERIAL WORLD			
	• Matter			
	Properties and characteristics of matter in different states (solid, liquid, gas):			
	shape			
	colour			
	-texture			
	mass and weight			
	- Effect of gravitational attraction on an object density (e.g. small objects that are light and heavy, big objects that are light and heavy)			

Essential Knowledges (cont)

MATERIAL WORLD (cont)			
• Matter (cont)			
relative density and buoyancy			
Changes in matter			
physical changes (e.g. breaking, grinding, phase changes)			
manufacturing household products (e.g. soap, paper, cement)			
• Energy			
Forms of energy:			
forms of energy (e.g. mechanical, electrical, chemical, heat, solar, sound, nuclear)			
Transmission of energy:			
sound waves (e.g. volume, timbre, echo)			
convection (e.g. in gases and liquids)			
Transformation of energy:			
consumption and conservation of energy by human beings (e.g. electric meter, insulation)			
transformations of energy from one form to another (e.g. transformation by machines)-			
• Forces and motion			
Effect of electrostatic attraction (e.g. paper attracted by a charged object)			
Effects of a force on the direction of an object (e.g. pushing, pulling)			
Characteristics of motion (e.g. direction, speed)			
• Systems and interaction			
Simple machines (e.g. lever, inclined plane, screw, pulley, winch)			
How manufactured objects work (e.g. materials, shapes, functions)			
Transportation technology (e.g. car, airplane, boat)			
Electron technology (e.g. telephone, radio, sound recording, television, transistor, microprocessor, computer)			
• Techniques and instrumentation			
Manufacturing (e.g. reading plans, marking out, cutting, assembling, finishing)			
Use of simple measuring instruments (e.g. rulers, dropper, balance, thermometer)			
Use of simple machines			

Essential Knowledges (cont)				
	MATERIAL WORLD (cont)			
	• Techniques and instrumentation (cont)			
	Use of tools (e.g. pliers, screwdriver, hammer, wrench, simple template)			
	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			
	• Appropriate language			
	Terminology related to an understanding of the material world			
	Conventions and types of representations specific to the concepts studied			
	Graphs (e.g. pictograph, histogram)			
	Tables			
	Drawings, sketches			
	Norms and standardization			
EARTH AND SPACE				
	• Matter			
	Properties and characteristics of matter on Earth			
	soil, water and air			
	traces of living things and fossils			
	Organization of matter:			
	crystals			
	Transformation of matter			
	water cycle			
	• Energy			
	Sources of energy:			
	solar energy			
	hydraulic energy (e.g. hydroelectric dam, tidal energy)			
	wind energy			
	renewable forms of energy			
	• Forces and motion			
	Rotation of the Earth (e.g. day and night, visible motion of the Sun and the stars)			
	• Systems and interaction			
	System involving the sun, the Earth and the moon			
The stars and the galaxies (e.g. constellations)				
Meteorological systems (e.g. clouds, precipitation, storms) and climates				

EARTH AND SPACE (cont)			
	• Systems and interaction (cont)		
	Technologies related to the Earth, the atmosphere and outer space (e.g. seismograph, prospection, weather forecasting, satellites, space station)		
	• Techniques and instrumentation		
	Use of simple observational instruments (e.g. binoculars, telescope)		
	Use of simple measuring instruments (e.g. rulers, balance, thermometer, weather vane, barometer, anemometer, hygrometer)		
	Design and manufacture of measuring instruments and prototypes		
	• Appropriate language		
	Terminology related to an understanding of the Earth and the universe		
	Conventions and types of representations (e.g. globe, constellations)		
	Drawing, sketches		
LIVING THINGS			
	• Matter		
	Characteristics of living things:		
	metabolism of plants and animals (e.g. nutrition, respiration, growth, death)		
	reproduction of plants and animals		
	Organization of living things:		
	classification of life forms (e.g. microorganisms, fungi, plants, animals)		
	anatomy of plants (e.g. parts of a plant)		
	anatomy of animals (e.g. parts and principal systems)		
	senses (sight, hearing, smell, taste, touch)		
	Transformations of living things		
	growth of plants and animals		
	• Energy		
	Sources of energy for living things:		
	nutrition for animals (e.g. need for water, sugars, lipids, proteins, vitamins, minerals)		

LIVING THINGS (cont)			
	• Energy (cont)		
	agricultural and food technologies (e.g. crossbreeding of plants and their propagation by cuttings, selection and breeding of animals, food production, pasteurization)		
	Transformation of energy in living things:		
	food chains		
	• Forces and motion		
	How animals move (e.g. reptation, walking, flying)		
	• Systems and interaction		
	Interaction between living organisms and their environment		
	living things and their habitats		
	parasitism, predation		
	Interaction between humans and their environment		
	Environmental technologies (e.g. recycling, composting)		
	• Techniques and instrumentation		
	Use of simple observational instruments (e.g. magnifying glass, binoculars, microscope)		
	Use of simple measuring instruments (e.g. rulers, dropper, balance, thermometer)		
	Design and manufacture of environments (e.g. aquarium, terrarium, incubator, greenhouse)		
	• Appropriate language		
	Terminology related to an understanding of living things		
	Conventions (e.g. plant and animal identification key)		
	Graphs (e.g. pictograph, histogram)		
Tables (e.g. plant and animal classification tables)			
Drawings, sketches			
STRATEGIES			
	• Exploration strategies		
	Studying a problem or a phenomenon from different points of view		
	Distinguishing between the different types of information useful for solving the problem		
	Recalling similar problems that have already been solved		

STRATEGIES (cont)			
	• Exploration strategies (cont)		
	Becoming aware of his or her previous representations		
	Drawing a diagram for the problem or illustrating it		
	Formulating questions		
	Putting forward hypotheses		
	Exploring various ways of solving the problem		
	Anticipating the results of his or her approach		
	Imagining solutions to a problem in light of his or her explanations		
	-Taking into account the constraints involved in solving a problem or making an object		
	Examining his or her mistakes in order to identify their source		
	Using different types of reasoning (e.g. induction, deduction, inference, comparison, classification)		
	Using empirical approaches (e.g. trial and error, analysis, exploration using one's senses)		
	• Strategies for recording, using and interpreting information		
	Using different sources of information		
	Validating sources of information		
	Using a variety of observational techniques and tools		
	Using technical design to illustrate a solution		
	Using different tools for recording information (e.g. diagrams, notes, graphs, procedures, logbook)		
	• Communication strategies		
	Using different means of communication to propose explanations or solutions (e.g. oral presentation, written presentation, procedure)		
	Using tools to display information in tables and graphs or to draw a diagram		
	Organizing information for a presentation		
	Exchanging information		
	Comparing different possible explanations for or solutions to a problem in order to assess them (e.g. full-group discussion)		

Suggestions for Using Information and Communications Technologies

	Using electronic mail to exchange information			
	Using the Internet to access Web sites related to science and technology			
	Using CD-ROMs to gather information on a topic he/she is studying			
	Organizing and presenting data using different types of software			
	Using simulation software			
	Using graphics software			
	Producing a graphical representation of data			
	Conducting experiments with the help of a computer			
	Robotics and automation			