



Competencies and Characteristics

Science and Technology

Cycle 3
2001-2002

Extracted from
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Bob Steele
The Lester B. Pearson School Board

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|--|---|--|--|--|
| 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 | | | |
| + other physical properties (e.g. elasticity, hardness, permeability and impermeability, solubility) | | | |
| + materials of which an object is made | | | |
| Changes in matter | | | |
| physical changes (e.g. breaking, grinding, phase changes) | | | |
| + chemical changes (e.g. simple chemical reactions: rust, combustion, acid-base) | | | |
| manufacturing household products (e.g. soap, paper, cement) | | | |
| • Energy | | | |
| Forms of energy: | | | |
| forms of energy (e.g. mechanical, electrical, chemical, heat, solar, sound, nuclear) | | | |
| + sources of energy (e.g. moving water, chemical reaction in a battery, sunlight) | | | |
| Transmission of energy: | | | |
| + thermal conductivity (e.g. conductors and insulators) | | | |
| + electrical conductivity (e.g. conductors and insulators) | | | |
| + simple electric circuits | | | |
| sound waves (e.g. volume, timbre, echo) | | | |
| + light radiation (e.g. reflection, refraction) | | | |
| 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 gravitational attraction on an object(e.g. free fall, pendulum) | | | |
| Effect of electrostatic attraction (e.g. paper attracted by a charged object) | | | |
| + Effect of electromagnetic attraction (e.g. magnet, electromagnet) | | | |
| + Pressure (e.g. pressure in a balloon, airplane wing) | | | |

Essential Knowledges (cont)

MATERIAL WORLD (cont)

| | | | |
|--|---|--|--|
| | • Forces and motion (cont) | | |
| | Effects of a force on the direction of an object (e.g. pushing, pulling) | | |
| | + Combined effects of several forces on an object (e.g. reinforcement, opposition) | | |
| | Characteristics of motion (e.g. direction, speed) | | |
| | • Systems and interaction | | |
| | Simple machines (e.g. lever, inclined plane, screw, pulley, winch) | | |
| | + Other machines (e.g. cart, waterwheel, windmill) | | |
| | How manufactured objects work (e.g. materials, shapes, functions) | | |
| | + Servomechanism and robots | | |
| | 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 | | |
| | 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 | | |
| | + Symbols (H O) | | |
| | Graphs (e.g. pictograph, histogram) | | |
| | Tables | | |
| | Drawings, sketches | | |
| | Norms and standardization | | |

Essential Knowledges (cont)

EARTH AND SPACE

| | | | |
|---|--|--|--|
| • Matter | | | |
| Properties and characteristics of matter on Earth | | | |
| soil, water and air | | | |
| traces of living things and fossils | | | |
| + classification of rocks and minerals | | | |
| Organization of matter: | | | |
| crystals | | | |
| + structure of the Earth (e.g. continents, oceans, ice caps, mountains, volcanoes) | | | |
| Transformation of matter | | | |
| water cycle | | | |
| + natural phenomena (e.g. erosion, lightning) | | | |
| • Energy | | | |
| Sources of energy: | | | |
| solar energy | | | |
| hydraulic energy (e.g. hydroelectric dam, tidal energy) | | | |
| wind energy | | | |
| + fossil fuel-based energy | | | |
| Transmission of energy (e.g. radiation) | | | |
| Transformation of energy: | | | |
| renewable forms of energy | | | |
| + nonrenewable forms of energy | | | |
| • Forces and motion | | | |
| Rotation of the Earth (e.g. day and night, visible motion of the Sun and the stars) | | | |
| + The tides | | | |
| • Systems and interaction | | | |
| System involving the sun, the Earth and the moon | | | |
| Solar system | | | |
| The seasons | | | |
| The stars and the galaxies (e.g. constellations) | | | |
| Meteorological systems (e.g. clouds, precipitation, storms) and climates | | | |
| Technologies related to the Earth, the atmosphere and outer space (e.g. seismograph, prospection, weather forecasting, satellites, space station) | | | |
| | | | |
| | | | |

Essential Knowledges (cont)

| EARTH AND SPACE (cont) | | | | |
|---|--|--|--|--|
| | • 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)] | | | |
| | + human reproductive system | | | |
| | Transformations of living things | | | |
| | growth of plants and animals | | | |
| | + metamorphoses (e.g. butterfly, frog) | | | |
| | + human growth and development | | | |
| | + evolution of life forms | | | |
| | • Energy | | | |
| | Sources of energy for living things: | | | |
| | nutrition for animals (e.g. need for water, sugars, lipids, proteins, vitamins, minerals) | | | |
| + photosynthesis in plants (e.g. need for water and carbon dioxide) | | | | |

Essential Knowledges (cont)

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] | | | |
| + ecological pyramids | | | |
| • Forces and motion | | | |
| How animals move (e.g. reptation, walking, flying) | | | |
| + Motion in plants (e.g. phototropism, hydrotropism, geotropism) | | | |
| • Systems and interaction | | | |
| Interaction between living organisms and their environment | | | |
| living things and their habitats | | | |
| parasitism, predation | | | |
| + adaptation (e.g. mimicry) | | | |
| 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 | | |
| | 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) | | |

| STRATEGIES (cont) | | | | |
|-------------------|--|--|--|--|
| | • Communication strategies (cont) | | | |
| | 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 | | | |