Observatory: The Environment, Second Year of Secondary Cycle Two
Overview of learning and evaluation situations (LES)

Abbreviations used:
ST: Science and Technology program
EST: Environmental Science and Technology program
AST: Applied Science and Technology program
SSC: Subject-specific competency
CCC: Cross-curricular competency
BAL: Broad area of learning

No. Title	Program	Description	Competencies evaluated	BAL	*Application* AST *or* Issue ST EST	Concepts
1 Atomix	ST EST	Students will create a playing card describing a superhero inspired by the characteristics of an element of the periodic table.	SSC2 (SSC3) CCC6	Environmental Awareness and Consumer Rights and Responsibilities	Residual materials	THE MATERIAL WORLD Rutherford-Bohr atomic model; Lewis notation; groups and periods of the periodic table; EST simplified atomic model; neutron; relative atomic mass; atomic number; periodicity of properties; isotopes
2 The sun to the rescue	ST EST	Given that the largest reserve of water on Earth is the oceans, would it make sense to convert seawater into drinking water? Students will answer this question by applying the experimental method.	SSC1 (SSC3) CCC2	Citizenship and Community Life	Drinking water	THE MATERIAL WORLD Concentration (ppm); electrolytes; electrolytic dissociation; ions; electrical conductivity; EST strength of electrolytes; salts; types of bonds (covalent, ionic) THE EARTH AND SPACE Solar energy flow; greenhouse effect; salinity; glacier and pack ice
3 Grandma's recipes	EST	Students will do a case study on the level of toxicity in household cleaning products. Are simple homemade cleansers just as effective but less toxic?	SSC1 CCC4	Media Literacy	Drinking water	THE MATERIAL WORLD Concentration (mol/L); nomenclature and notation rules; polyatomic ions; concept of mole; Avogadro's number THE EARTH AND SPACE Phosphorus cycle; nitrogen cycle; contamination (hydrosphere); eutrophication THE TECHNOLOGICAL WORLD Wastewater treatment; biodegradation of pollutants
4 Eco-friendly bags	ST EST AST	Students will assess the environmental impact of various types of food-packaging materials, including glass, plastic, paper and metal. Students following the EST program will also write questions for an ecological footprint quiz about eating habits.	SSC2 CCC1	Environmental Awareness and Consumer Rights and Responsibilities	*Agricultural and agri-food technologies* Food production	THE LIVING WORLD Disturbances; EST ecological footprint THE TECHNOLOGICAL WORLD Types and properties of materials (plastics, ceramics, composites); modification of properties (degradation, protection); EST and AST heat treatments

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No. Title	Program	Description	Competencies evaluated	BAL	*Application* AST *or* Issue ST EST	Concepts
5 The solar furnace	AST	Students will build a solar furnace to certain specifications.	SSC1 CCC5	Citizenship and Community Life	*Agricultural and agri-food technologies*	THE EARTH AND SPACE Solar energy flow THE TECHNOLOGICAL WORLD Developments (prism, cylinder, pyramid, cone); control, shape and position (plane, section, angle)
6 Home comfort	ST EST AST	Students will test the energy efficiency of different types of thermal insulation and choose the best type for limited environmental impact as well as efficiency.	SSC1 CCC7	Environmental Awareness and Consumer Rights and Responsibilities	*Energy technologies* Energy	THE MATERIAL WORLD Law of conservation of energy; energy efficiency; distinction between heat and temperature; EST relationship between heat energy, specific heat capacity, mass and temperature variations
7 Nice and warm	EST AST	Students will build a prototype of an energy-efficient house. They could use the thermal insulation they tested in LES6.	SSC1 CCC8	Career Planning and Entrepreneurship	*Construction technologies* Residual materials	THE TECHNOLOGICAL WORLD Manufacturing (characteristics of laying out, drilling, tapping, threading, bending); direct measurement (vernier caliper); multiview orthogonal projection (general arrangement); EST dimensional tolerances; shaping (machines and tools); axonometric projection: exploded view (reading); AST functional dimensioning
8 Is there a monster in the lake?	ST EST AST	Students will answer the title question of the LES by analyzing various data on the food resources available in a lake in Québec.	SSC2 (SSC3) CCC6	Media Literacy	*Information and communications technologies* Drinking water	THE LIVING WORLD Trophic relationships; primary productivity; material and energy flow; chemical recycling; AST ecosystem THE EARTH AND SPACE Factors that influence the distribution of biomes; ST and EST aquatic biomes
9 Disaster ahead	ST EST	A train derailment has caused an acid spill. Students will evaluate the impact of the acid spill, taking the geography of the area into account, and determine the most effective way to neutralize the acid.	SSC1 CCC5	Health and Well-Being	Residual materials	THE MATERIAL WORLD Acid-base neutralization reaction; balancing chemical equations; law of conservation of mass; pH scale; EST endothermic and exothermic reactions; stoichiometry THE EARTH AND SPACE Soil profile (horizons); minerals; watershed; permafrost; EST soil depletion; buffering capacity of the soil

Overview of learning and evaluation situations (LES) (*continued*)

No. Title	Program	Description	Competencies evaluated	BAL	*Application* AST *or* Issue ST EST	Concepts
10 Turning like clockwork	ST EST AST	Students will build a prototype of an object to gauge wind strength. The device will contain at least one motion transmission system and one motion transformation system as well as meeting other specifications.	SSC1 CCC4	Career Planning and Entrepreneurship	*Manufacturing technologies* Climate change	THE TECHNOLOGICAL WORLD Guiding controls; construction and characteristics of motion transformation systems; construction and characteristics of motion transmission systems; speed changes; constraints (deflection, shearing); characteristics of mechanical properties; ST and EST characteristics of the linking of mechanical parts; EST and AST adhesion and friction of parts; degrees of freedom of movement; AST resisting torque; engine torque
11 A question of ethics or science?	EST	Students will write a pamphlet on a genetic disease to inform parents who want to know more about it and especially about the risk their unborn children run of having the disease or being a carrier of the disease-causing gene.	SSC2 CCC9	Health and Well-Being	Food production	THE LIVING WORLD Heredity; gene; allele; character trait; genotype and phenotype; homozygote and heterozygote; dominance and recessivity; crossbreeding; protein synthesis THE TECHNOLOGICAL WORLD Cloning
12 How does it work?	ST EST AST	Students will analyze and compare the electrical circuits in a traditional flashlight and a dynamo flashlight.	SSC2 CCC8	Environmental Awareness and Consumer Rights and Responsibilities	*Energy technologies* Energy	THE MATERIAL WORLD Electrical charge; static electricity; Ohm's law; electrical circuits; relationship between power and electrical energy; magnetic field of a live wire; forces of attraction and repulsion; EST Kirchhoff's laws; electrical field; Coulomb's law; EST and AST magnetic field of a solenoid; AST electromagnetic induction
13 It's electric!	ST EST AST	Students will build a gauge for a rainwater tank to certain specifications.	SSC1 CCC2	Career Planning and Entrepreneurship	*Manufacturing technologies* Drinking water	THE TECHNOLOGICAL WORLD Power supply; conduction, insulation and protection (EST and AST resistance and coding, printed circuit); control (EST and AST typical controls); transformation of energy (electricity and light, heat, vibration, magnetism; EST and AST other functions (capacitor, diode AST transistor, solid-state relay)
14 Energy close to home	ST EST AST	Students will form an opinion on the energy resource to develop for power generation in a region: tidal energy, wind energy, nuclear energy, geothermal energy or biogas.	SSC2 CCC3	Environmental Awareness and Consumer Rights and Responsibilities	*Energy technologies* Energy	THE MATERIAL WORLD Combustion; EST nuclear stability; radioactivity; fission and fusion; EST and AST oxidation THE EARTH AND SPACE Energy resources (lithosphere); Earth-Moon system (gravitational effect); air mass; cyclone and anticyclone; energy resources (atmosphere); energy resources (hydrosphere); ST and EST ocean circulation; EST atmospheric circulation; prevailing winds; contamination (atmosphere); ozone

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No. Title	Program	Description	Competencies evaluated	BAL	*Application* AST *or* Issue ST EST	Concepts
15 Threat or solution?	EST	Students will weigh the arguments for and against the use of DDT to prevent malaria in Mali.	SSC2 CCC9	Citizenship and Community Life	Residual materials	THE EARTH AND SPACE Contamination (lithosphere); contamination (hydrosphere) THE LIVING WORLD Ecotoxicology (contaminant, bioconcentration, bioaccumulation, toxicity threshold)
16 At top speed	EST	Students will conduct trials to analyze energy losses in a model roller coaster in order to design a model that is as energy-efficient as possible.	SSC1 (SSC3) CCC5	Career Planning and Entrepreneurship	Energy	THE MATERIAL WORLD Relationship between potential energy, mass, acceleration and travel; relationship between mass and weight; relationship between kinetic energy, mass and velocity; relationship between work, force and travel; relationship between work and energy; effective force
17 A park in the city	ST EST	Students will consider the location of a future park in a city. What type of park will offer the greatest biodiversity possible? Should the site be developed or left in its natural state?	SSC2 CCC9	Health and Well-Being	Deforestation	THE LIVING WORLD Study of populations (density, biological cycles); biodiversity THE EARTH AND SPACE Terrestrial biomes; carbon cycle; nitrogen cycle THE MATERIAL WORLD Photosynthesis and respiration
18 The submarine	AST	Students will analyze a toy submarine to improve the way it rises and dives in the bathtub.	SSC2 CCC9	Career Planning and Entrepreneurship	*Transportation technologies*	THE MATERIAL WORLD Archimedes' principle; Pascal's principle; Bernoulli's principle; force; types of forces; equilibrium of two forces; relationship between constant speed, distance and time; mass and weight