

Grade 5, Cluster 0: Overall Skills and Attitudes

Overview

Cluster 0* comprises nine categories of specific student learning outcomes (SLOs) that describe the skills and attitudes involved in scientific inquiry, the design process, or both.

In scientific inquiry at Grades 5 and 6, students begin to develop the concept of a fair test. This includes developing a prediction/hypothesis that identifies a cause and effect relationship; controlling variables; repeating measurements to increase accuracy and reliability; and drawing conclusions that support or reject their initial predictions/hypotheses. In the design process, students continue to identify and address practical problems through the construction of a prototype. Increasingly sophisticated criteria are used to analyze a prototype, including use of recycled materials, cost, and reliability. Students begin to apply their problem-solving skills in the evaluation of consumer products based on identified criteria in order to determine the best product for a specific purpose. For example, in choosing between pre-packaged pizzas, the various factors of cost, nutritional value, and packaging may influence students' evaluation of the product.

Although the thematic clusters (Clusters 1 to 4) include certain skills and attitudes, Cluster 0 fully defines scientific inquiry and design process skills and attitudes at each grade level. Teachers should select appropriate contexts to introduce and reinforce Cluster 0 SLOs over the course of the school year. To assist in planning and to facilitate curricular integration, many SLOs within Cluster 0 are accompanied by links to SLOs in other subject areas, specifically English language arts (ELA) and mathematics (Math). There are also links to *Technology As a Foundation Skill Area* (TFS).

* Cluster 0: Overall Skills and Attitudes are also presented as part of a Grades 5 to 8 chart (separate attachment).

Students will...

	Scientific Inquiry	Design Process
Initiating	<p>5-0-1a Formulate, with guidance, specific questions that lead to investigations. Include: rephrase questions to a testable form, focus research questions. GLO: A1, C2 (ELA Grade 5, 3.1.1; Math: SP-I.1.5)</p> <p>5-0-1b Identify various methods for finding the answer to a specific question and, with guidance, select one to implement. Examples: generating experimental data; accessing information from a variety of sources... GLO: C2 (ELA Grade 5, 3.2.2; Math: SP-II.1.5)</p>	<p>5-0-1c Identify practical problems to solve. Examples: How can I determine the mass of air? Which prepared pizza should I buy?... GLO: C3</p> <p>5-0-1d Identify various methods to solve a practical problem, and select and justify one to implement. Examples: constructing and testing a prototype; evaluating consumer products; accessing information from a variety of sources... GLO: C3 (Math: SP-II.1.5)</p>
Researching	<p>5-0-2a Access information using a variety of sources. Examples: libraries, magazines, community resource people, outdoor experiences, videos, CD-ROMs, Internet... GLO: C6 (ELA Grade 5, 3.2.3; Math: SP-II.3.1)</p> <p>5-0-2b Review information to determine its usefulness, using predetermined criteria. GLO: C6, C8</p> <p>5-0-2c Record information in own words and reference sources appropriately. GLO: C6 (ELA Grade 5, 3.3.2)</p>	

	Scientific Inquiry	Design Process
Planning	<p>5-0-3a Formulate, with guidance, a prediction/hypothesis that identifies a cause and effect relationship. GLO: A2, C2 (Math: SP-I.1.5)</p> <p>5-0-3b Identify variables that might have an impact on their experiments and, with guidance, variables to hold constant to ensure a fair test. GLO: A2, C2</p> <p>5-0-3c Create a written plan to answer a specific question. Include: apparatus, materials, safety considerations, steps to follow. GLO: C2 (ELA Grade 5, 3.1.4)</p>	<p>5-0-3d Develop criteria to evaluate a prototype or consumer product. Include: function, aesthetics, use of recycled materials, cost, reliability. GLO: C3</p> <p>5-0-3e Create a written plan to solve a problem. Include: materials, safety considerations, labelled diagrams of top and side views, steps to follow. GLO: C1, C3, C6</p>
	<p>5-0-4a Carry out, with guidance, procedures that comprise a fair test. Include: controlling variables, repeating measurements to increase accuracy and reliability. GLO: C2</p>	<p>5-0-4b Construct a prototype. GLO: C3</p>
Implementing a Plan	<p>5-0-4c Work cooperatively with group members to carry out a plan, and troubleshoot problems as they arise. GLO: C7 (ELA Grade 5, 5.2.2)</p> <p>5-0-4d Assume various roles and share responsibilities as group members. GLO: C7 (ELA Grade 5, 5.2.2)</p> <p>5-0-4e Use tools and materials in a manner that ensures personal safety and the safety of others. Include: keeping an uncluttered workspace; putting equipment away after its use; handling glassware with care. GLO: C1</p>	

	Scientific Inquiry	Design Process
Observing, Measuring, Recording	<p>5-0-5a Make observations that are relevant to a specific question. GLO: A1, A2, C2</p>	<p>5-0-5b Test a prototype or consumer product, using predetermined criteria. GLO: C3, C5</p>
	<p>5-0-5c Select and use tools and instruments to observe, measure, and construct. Include: balance, thermometer, spring scale, weather instruments. GLO: C2, C3, C5</p> <p>5-0-5d Evaluate the appropriateness of units and measuring tools in practical contexts. GLO: C2, C5 (Math: SS-I.1.5)</p> <p>5-0-5e Estimate and measure mass/weight, length, volume, and temperature using SI and other standard units. GLO: C2, C5 (Math: SS-IV.1.5, SS-III.1.5, SS-I.1.5, SS-VIII.4.3)</p> <p>5-0-5f Record and organize observations in a variety of ways. <i>Examples: point-form notes, sentences, labelled diagrams, charts, ordered lists of data, frequency diagrams, spread sheets...</i></p>	
Analyzing and Interpreting	<p>5-0-6a Construct graphs to display data, and interpret and evaluate these and other graphs. <i>Examples: bar graphs, frequency tallies, line plots, broken line graphs...</i> GLO: C2, C6 (ELA Grade 5, 3.3.1; Math: SP-II.1.5, SP-III.2.5, SP-IV.1.5; TFS: 4.2.2–4.2.6)</p> <p>5-0-6c Identify and suggest explanations for patterns and discrepancies in data. GLO: A1, A2, C2, C5</p>	<p>5-0-6d Identify and make improvements to a prototype, and explain the rationale for the changes. GLO: C3, C4</p> <p>5-0-6e Evaluate the strengths and weaknesses of a consumer product, based on predetermined criteria. GLO: C3, C4</p>
	<p>5-0-6f Evaluate the methods used to answer a question or solve a problem. GLO: C2, C3 (ELA Grade 5, 3.3.4)</p>	

Students will...

	Scientific Inquiry	Design Process
Concluding and Applying	<p>5-0-7a Draw, with guidance, a conclusion that explains investigation results. Include: explaining patterns in data; supporting or rejecting a prediction/hypothesis. GLO: A1, A2, C2 (ELA Grade 5, 3.3.4)</p> <p>5-0-7b Base conclusions on evidence rather than pre-conceived ideas or hunches. GLO: C2, C4</p> <p>5-0-7c Identify, with guidance, a new prediction/hypothesis, based on investigation results. GLO: A1, C2 (ELA Grade 5, 3.3.4)</p>	<p>5-0-7d Propose and justify a solution to the initial problem. GLO: C3</p> <p>5-0-7e Identify new practical problems to solve. GLO: C3</p>
	<p>5-0-7f Use prior knowledge and experiences selectively to make sense of new information in a variety of contexts. GLO: A2, C4 (ELA Grade 5, 1.2.1)</p> <p>5-0-7g Communicate methods, results, conclusions, and new knowledge in a variety of ways. Examples: oral, written, multimedia presentations... GLO: C6 (ELA Grade 5, 4.4.1; TFS: 3.2.2, 3.2.3)</p> <p>5-0-7h Identify, with guidance, potential applications of investigation results. GLO: C4</p>	

	Scientific Inquiry	Design Process
Reflecting on Science and Technology	<p>5-0-8a Recognize that science is a way of answering questions about the world and that there are questions that science cannot answer. GLO: A1, A3</p> <p>5-0-8b Identify examples of scientific knowledge that have developed as a result of the gradual accumulation of evidence. GLO: A2</p>	<p>5-0-8c Recognize that technology is a way of solving problems in response to human needs. GLO: A3, B2</p> <p>5-0-8d Provide examples of technologies from the past and describe how they have evolved over time. GLO: B1</p>
	<p>5-0-8e Describe hobbies and careers related to science and technology. GLO: B4</p> <p>5-0-8f Recognize that science is organized into specialized disciplines. GLO: A1, B4</p>	
	<p>5-0-8g Describe positive and negative effects of scientific and technological endeavours. Include: effects on themselves, society, the environment, and the economy. GLO: A1, B1, B3, B5</p>	

	Scientific Inquiry	Design Process
Demonstrating Scientific and Technological Attitudes	<p>5-0-9a Appreciate that women and men of diverse cultural backgrounds can contribute equally to science. GLO: A4</p> <p>5-0-9b Show interest in the activities of individuals working in scientific and technological fields. GLO: B4</p> <p>5-0-9c Demonstrate confidence in their ability to carry out investigations. GLO: C5</p> <p>5-0-9d Appreciate the importance of creativity, accuracy, honesty, and perseverance as scientific and technological habits of mind. GLO: C5</p> <p>5-0-9e Be sensitive to and develop a sense of responsibility for the welfare of other humans, other living things, and the environment. GLO: B5</p> <p>5-0-9f Frequently and thoughtfully evaluate the potential consequences of their actions. GLO: B5, C4</p>	

Grade 5, Cluster 1: Maintaining a Healthy Body

Overview

The study of the human body at Grade 5 focusses on the maintenance of good health. Students learn about the role that nutrients play, and how to plan balanced and nutritious meals using *Canada's Food Guide to Healthy Eating*. Students gain experience in interpreting nutritional information on food labels, and in evaluating images presented by the media. A study of the major body systems and their role in the healthy functioning of the human body helps students to appreciate the nature and function of each, and the interrelationships that exist between systems. Students explore how lifestyle choices and environmental factors can affect personal health.

Students will...

- 5-1-01 Use appropriate vocabulary related to their investigations of human health.
Include: nutrients; carbohydrates; proteins; fats; vitamins; minerals; *Canada's Food Guide to Healthy Eating*; food group; serving size; terms related to the digestive, skeletal, muscular, nervous, integumentary, respiratory, and circulatory systems.
GLO: B3, C6, D1
- 5-1-02 Interpret nutritional information found on food labels.
Examples: ingredient proportions, identification of potential allergens, information related to energy content and nutrients...
GLO: B3, C4, C5, C8
- 5-1-03 Describe the types of nutrients in foods and their function in maintaining a healthy body.
Include: carbohydrates, proteins, fats, vitamins, minerals.
GLO: B3, D1
- 5-1-04 Evaluate a daily menu plan and suggest changes to make it align more closely with *Canada's Food Guide to Healthy Eating*.
Include: serving size recommendations according to age for each food group.
GLO: B3, C3, C4, C8

- 5-1-05 Evaluate prepared food products using the design process.
Examples: frozen pizza, snack foods, beverages...
GLO: B3, C3, C4, C8
- 5-1-06 Identify the major components of the digestive system, and describe its role in the human body.
Include: teeth, mouth, esophagus, stomach, and intestines break down food.
GLO: D1, E2,
- 5-1-07 Identify the major components of the skeletal, muscular, and nervous systems, and describe the role of each system in the human body.
Include: the skeleton provides protection and support; muscles, tendons, and ligaments enable movement; brain, spinal cord, and nerves receive sensory input, process information, and send out signals.
GLO: D1, E2
- 5-1-08 Identify skin as the major component of the integumentary system, and describe its role in protecting and supporting the human body.
GLO: D1, E2
- 5-1-09 Identify components of the human body's defenses against infections, and describe their role in defending the body against infection.
Include: tears, saliva, skin, white blood cells.
GLO: D1, E2
- 5-1-10 Identify the major components of the respiratory and circulatory systems, and describe the role of each system in the human body.
Include: the nose, trachea, and lungs take in oxygen and expel carbon dioxide; the heart, blood vessels, and blood transport oxygen, nutrients, and waste products such as carbon dioxide.
GLO: D1, E2
- 5-1-11 Describe how the human body gets rid of waste.
Include: kidneys filter blood and dispose of waste as urine; lungs give off waste carbon dioxide; the rectum collects and expels undigested food matter.
GLO: D1, E2
- 5-1-12 Give examples of how systems of the human body work together.
Examples: the circulatory system transports nutrients from the digestive system and oxygen from the respiratory system to the muscular system...
GLO: D1, E2
- 5-1-13 Identify and describe factors necessary to maintain a healthy body.
Include: daily physical activity, a balanced diet, fluid replacement, adequate sleep, appropriate hygiene practices, regular check-ups.
GLO: B3, C4, D1

(continued)

Grade 5, Cluster 1: Maintaining a Healthy Body (continued)

- 5-1-14 Evaluate information related to body image and health from media sources for science content and bias.

Examples: glamorization of smoking in movies, promotion of unrealistic role models in magazines, trivialization of scientific information on television...

GLO: B3, C4, C5, C8

- 5-1-15 Explain how human health may be affected by lifestyle choices and natural- and human-caused environmental factors.

Include: smoking and poor air quality may cause respiratory disorders; unhealthy eating and physical inactivity may lead to diabetes or heart disease; prolonged exposure to the Sun can cause skin cancer.

GLO: B3, B5, C4, D1

Notes

Grade 5, Cluster 2: Properties of and Changes in Substances

Overview

In this cluster, students deepen their understanding of the characteristics and properties of substances, and the changes that occur in substances in different situations. Through their explorations, students identify the three states of matter — solids, liquids, and gases — and describe the properties of each. Students observe examples of reversible and non-reversible changes including changes of state. Students also investigate how the characteristics and properties of substances are altered during physical and chemical changes. Students identify examples of these changes in the world around them. Safety practices related to chemical products in the home are addressed. Students evaluate household products by using criteria such as efficiency, cost, and environmental impact.

Students will...

- 5-2-01 Use appropriate vocabulary related to their investigations of properties of, and changes in, substances.
Include: characteristic, property, substance, matter, volume, state, solid, liquid, gas, reversible and non-reversible changes, physical change, chemical change, chemical product, raw material.
GLO: C6, D3
- 5-2-02 Identify characteristics and properties that allow substances to be distinguished from one another.
Examples: texture, hardness, flexibility, strength, buoyancy, solubility, colour, mass/weight for the same volume...
GLO: D3, E1
- 5-2-03 Investigate to determine how characteristics and properties of substances may change when they interact with one other.
Examples: baking soda in vinegar produces a gas; adding flour to water produces a sticky paste...
GLO: C2, D3, E3
- 5-2-04 Recognize that matter is anything that has mass/weight and takes up space.
GLO: D3

- 5-2-05 Identify properties of the three states of matter.
Include: 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.
GLO: D3
- 5-2-06 Experiment to compare the mass/weight of a substance in its liquid and solid states.
Examples: compare the mass of ice cubes with the mass of the liquid that results when they melt...
GLO: C2, D3, E3
- 5-2-07 Demonstrate that the mass/weight of a whole object is equal to the sum of the mass/weight of its parts.
Examples: compare the mass/weight of a pencil case and its contents with that of the individual components weighed separately and added together...
GLO: C2, D3, E3
- 5-2-08 Demonstrate that changes of state are reversible through the addition or removal of heat.
Include: melting, freezing/solidification, condensation, evaporation.
GLO: D3, E3, E4
- 5-2-09 Explore to identify reversible and non-reversible changes that can be made to substances.
Examples: reversible — folding paper, mixing baking soda and marbles; non-reversible — cutting paper, mixing baking soda and vinegar...
GLO: C2, D3, E3
- 5-2-10 Recognize that a physical change alters the characteristics of a substance without producing a new substance, and that a chemical change produces a new substance with distinct characteristics and properties.
GLO: D3, E3
- 5-2-11 Observe examples of changes in substances, classify them as physical or chemical changes, and justify the designation.
Examples: physical — bending a nail, chopping wood, chewing food; chemical — rusting of a nail, burning wood, cooking food...
GLO: C2, D3, E3
- 5-2-12 Identify potentially harmful chemical products used at home, and describe practices to ensure personal safety.
Include: use of products with parental supervision, recognition of safety symbols, procedures to follow in case of an emergency, proper storage of chemical products.
GLO: B1, C1, D3
- 5-2-13 Evaluate household chemical products using the design process.
Examples: glass-cleaner, laundry soap, toothpaste...
GLO: B5, C3, C4, C8
- 5-2-14 Research and describe how raw materials are transformed into useful products.
Examples: food processing, oil refining, paper milling, plastic moulding, gold smelting...
GLO: B1, B4, C2, E3

Grade 5, Cluster 3: Forces and Simple Machines

Overview

In this cluster, students increase their understanding of forces through the study of simple machines. Emphasis is placed on investigating a variety of simple machines and recognizing their usefulness for moving and lifting loads. Students explore how simple machines are used in daily life, and they identify advantages and disadvantages of using simple machines for a given task. Students apply their knowledge of simple machines by designing, constructing, and evaluating a prototype.

Students will...

- 5-3-01 Use appropriate vocabulary related to their investigations of forces and simple machines.
Include: applied force, balanced and unbalanced forces, fulcrum, load, friction, terms related to types of simple machines.
GLO: C6, D4
- 5-3-02 Describe, using diagrams, the forces acting on an object and the effects of increasing or decreasing them.
Include: force arrows representing direction and relative strength of forces acting in the same plane, balanced and unbalanced forces.
GLO: C6, D4
- 5-3-03 Investigate a variety of levers used to accomplish particular tasks in order to compare them qualitatively with respect to fulcrum position, applied force, and load.
Include: first-class, second-class, and third-class levers.
GLO: C2, D4, E1
- 5-3-04 Identify objects in the school and at home that use wheels and axles, and describe the forces involved.
Examples: doorknob, manual pencil sharpener, hinge, bicycle...
GLO: B1, D4, E1

- 5-3-05 Recognize that a gear is a wheel and axle used to turn another wheel and axle.
GLO: D4, E2
- 5-3-06 Identify common devices and systems that incorporate pulleys and/or gears.
GLO: A5, B1, D4, E1
- 5-3-07 Explore to determine how the direction and amount of the applied force and the speed of rotation vary within a two-gear system.
GLO: C2, D4, E2
- 5-3-08 Compare, quantitatively, the force required to lift a load using a pulley system versus a single fixed pulley, and recognize the relationship between the force required and the distance over which the force is applied.
Include: a system of pulleys reduces the force required while increasing the distance over which the force is applied; a single fixed pulley requires a greater force but applies it over a shorter distance.
GLO: C2, D4, E2
- 5-3-09 Identify and make modifications to their own pulley and/or gear systems to improve how they move loads.
Include: reducing friction.
GLO: C3, D4, E2
- 5-3-10 Identify and describe types of simple machines.
Include: levers, wheel and axle, pulley, gear, inclined plane, screw, wedge.
GLO: D4
- 5-3-11 Describe the advantage of using simple machines to move or lift a given load.
Include: to decrease the force required; to increase the resulting force; to change the direction of the applied force.
GLO: D4
- 5-3-12 Investigate to identify advantages and disadvantages of using different simple machines to accomplish the same task.
Examples: using a pulley, inclined plane, or lever to move a piano to the second floor...
GLO: B1, C2, C4, D4
- 5-3-13 Compare devices that use variations of simple machines to accomplish similar tasks.
Examples: a short- or long-handled pump, a racing or mountain bicycle...
GLO: B1, C3, C4, D4
- 5-3-14 Use the design process to construct a prototype containing a system of two or more different simple machines that move in a controlled way to perform a specific function.
GLO: C3, D4, E2

Grade 5, Cluster 4: Weather

Overview

In this cluster, students learn that daily weather conditions are not the result of random occurrences, but of global systems that can be predicted on a short-term and a seasonal basis. Through observations and measurements, students investigate the properties of air and other aspects of daily weather. Students learn to interpret public weather reports and investigate the usefulness of various ways of predicting the weather. Understanding the meaning of severe weather forecasts and the preparations to ensure personal safety are emphasized. Students recognize the role of technology in increasing scientific understanding of weather while appreciating the limitations in accurately predicting long-term weather trends. They also investigate factors that influence climate in Manitoba and across Canada.

Students will...

- 5-4-01 Use appropriate vocabulary related to their investigations of weather.
Include: weather; properties; volume; pressure; air masses; fronts; weather instrument; severe weather; forecast; accuracy; water cycle; climate; terms related to public weather reports, and cloud formations.
GLO: C6, D5
- 5-4-02 Describe how weather conditions may affect the activities of humans and other animals.
Examples: heavy rainfall may cause roads to wash out; stormy conditions may prevent a space shuttle launching; in excessive heat cattle may produce less milk...
GLO: D5
- 5-4-03 Describe properties of air.
Include: has mass/weight and volume; expands to fill a space; expands and rises when heated; contracts and sinks when cooled; exerts pressure; moves from areas of high pressure to areas of low pressure.
GLO: D3

- 5-4-04 Recognize that warm and cold air masses are important components of weather, and describe what happens when these air masses meet along a front.
Include: in a cold front the cold air mass slides under a warm air mass, pushing the warm air upwards; in a warm front the warm moist air slides up over a cold air mass.
GLO: D5, E2
- 5-4-05 Use the design process to construct a weather instrument.
Examples: an instrument that measures wind direction, wind speed, rainfall...
GLO: C3, D5
- 5-4-06 Observe and measure local weather conditions over a period of time, using student-constructed or standard instruments, and record and analyze these data.
GLO: A2, C2, C5, D5
- 5-4-07 Identify and describe components of public weather reports from a variety of sources.
Include: temperature; relative humidity; wind speed and direction; wind chill; barometric pressure; humidex; cloud cover; ultraviolet index; warm and cold fronts; amount, types, and probability of precipitation.
GLO: C6, D5
- 5-4-08 Describe the key features of a variety of weather phenomena.
Examples: wind speed and precipitation of blizzards...
GLO: D5, E1, E2
- 5-4-09 Provide examples of severe weather forecasts, and describe preparations for ensuring personal safety during severe weather and related natural disasters.
Examples: tornado, thunderstorm, blizzard, extreme wind chill, flood, forest fire...
GLO: B3, C1, D5
- 5-4-10 Investigate various ways of predicting weather, and evaluate their usefulness.
Examples: weather-related sayings, traditional knowledge, folk knowledge, observations of the natural environment...
GLO: A2, A4, B2, C8
- 5-4-11 Contrast the accuracy of short- and long-term weather forecasts, and discuss possible reasons for the discrepancies.
Include: long-term forecasts may not be accurate as weather is a complex natural phenomenon that science is not yet able to predict accurately.
GLO: A1, C2
- 5-4-12 Describe examples of technological advances that have enabled humans to deepen their scientific understanding of weather and improve the accuracy of weather predictions.
Examples: satellites collect data that scientists analyze to increase understanding of global weather patterns; computerized models predict weather...
GLO: A2, A5, B1, D5

(continued)

Grade 5, Cluster 4: Weather (continued)

5-4-13 Explain how the transfer of energy from the Sun affects weather conditions.

Include: the Sun's energy evaporates water and warms the Earth's land, water, and air on a daily basis.

GLO: D4, D5, E4

5-4-14 Explain how clouds form, and relate cloud formation and precipitation to the water cycle.

GLO: D5, E2

5-4-15 Identify and describe common cloud formations.

Include: cumulus, cirrus, stratus.

GLO: D5, E1

5-4-16 Differentiate between weather and climate.

Include: weather includes the atmospheric conditions existing at a particular time and place; climate describes the long-term weather trend of a particular region.

GLO: D5, E1

5-4-17 Identify factors that influence weather and climate in Manitoba and across Canada, and describe their impacts.

Examples: jet stream, proximity to water, elevation, chinook...

GLO: D5, E2

5-4-18 Recognize that climates around the world are ever changing, and identify possible explanations.

Examples: volcanic eruptions, ozone depletion, greenhouse effect, El Niño, deforestation...

GLO: B5, D5, E2, E3

Notes