

Grade 3, Cluster 0: Overall Skills and Attitudes

Students will...

Overview

Cluster “0” comprises nine categories of specific learning outcomes related to skills and attitudes* involved in scientific inquiry, the design process, or both. In Grades 3 and 4 students develop scientific inquiry skills and attitudes as they plan and conduct simple experiments. They refine their design-process skills as they progress through the grades, gradually behaving more independently in designing, constructing, and testing objects, and devices. Students also acquire key attitudes, an increased awareness of the nature of science, and other skills related to research, communication, the use of information technology, and cooperative learning.

Teachers should select appropriate contexts to introduce and reinforce the scientific inquiry and design process skills and attitudes within the thematic clusters (Clusters 1 to 4) over the course of the school year. For example, students in one Grade 4 class may be introduced to graphing skills during a study of deer populations, and develop them further while graphing sound frequency. In contrast, students in another Grade 4 class may have opportunities to acquire and practise these skills in other clusters. To assist in planning and to facilitate curricular integration, many learning outcomes within this cluster are accompanied by links to specific learning outcomes 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 specific learning outcomes for this grade are also presented as part of a Kindergarten to Grade 4 chart (separate attachment). The purpose of this chart is to provide support related to the tracking of the development of skills and attitudes across several grades.

	Scientific Inquiry	Design Process
Initiating	<p>3-0-1a. Ask questions that lead to investigations of living things, objects, and events in the local environment. (ELA 1.2.4) GLO: A1, C2, C5</p> <p>3-0-1b. Make predictions based on observed patterns, collected data, or data provided from other sources. (ELA 1.1.1; Math SP-IV.2.3) GLO: A1, C2</p>	<p>3-0-1c. Identify practical problems to solve in the local environment. GLO: C3</p>
Researching	<p>3-0-2a. Access information using a variety of sources. <i>Examples: children’s magazines, local farmers, CD-ROMs, Internet...</i> (ELA 1.1.2, 3.2.2; Math SP-I.1.2.3; TFS 2.1.1) GLO: C6</p> <p>3-0-2b. Review information to determine its usefulness to research needs. (ELA 3.2.3, 3.3.3) GLO: C6, C8</p>	
Planning	<p>3-0-3a. Brainstorm, with the class, one or more methods of finding the answer to a given question and reach consensus on which method to implement. GLO: C2, C7</p> <p>3-0-3b. Identify, with the class, variables that have an impact on an investigation. GLO: A1, A2, C2, C7</p> <p>3-0-3c. Create, with the class, a plan to answer a given question. (ELA 3.1.4) GLO: C2, C7</p>	<p>3-0-3d. Brainstorm, in small groups, possible solutions to a practical problem, and reach consensus on which solution to implement. GLO: C3, C7</p> <p>3-0-3e. Create, in small groups, a written plan to solve a problem or meet a need. Include: identify steps to follow, prepare a simple diagram. (ELA 1.2.3) GLO: C3, C7</p> <p>3-0-3f. Develop, in small groups, limited criteria to evaluate an object or device based on its function and aesthetics. GLO: C3, C7</p>
Implementing a Plan	<p>3-0-4a. Carry out a plan, and describe the steps followed. (Math SP-V.2.3) GLO: C2</p>	<p>3-0-4b. Construct an object or device to solve a problem or meet a need. GLO: C3</p> <p>3-0-4c. Test an object or device with respect to pre-determined criteria. GLO: C3, C5</p> <p>3-0-4d. Identify and make improvements to an object or device, and explain the rationale for the changes. GLO: C3</p>

	Scientific Inquiry	Design Process
Implementing a Plan (cont'd)	<p>3-0-4e. Respond respectfully to the ideas and actions of others, and recognize their ideas and contributions. (ELA 1.1.2, 5.2.2) GLO: C5, C7</p> <p>3-0-4f. Assume roles and share responsibilities as group members. (ELA 5.2.1) GLO: C7</p> <p>3-0-4g. Verbalize questions, ideas, and intentions during classroom-learning experiences. GLO: C6</p> <p>3-0-4h. Follow given safety procedures and rules, and explain why they are needed. GLO: C1</p>	
Observing, Measuring, Recording	<p>3-0-5a. Make observations that are relevant to a specific question. GLO: A1, A2, C2</p> <p>3-0-5b. Use tools to observe, measure, and construct. Include: ruler, meter stick, pan balance, magnifying glass, bathroom scale, thermometer, magnet. (Math SS-I.1.3, SS-III.1.3, SS-IV.1.3, SS-VII.4.3) GLO: C2, C3, C5</p> <p>3-0-5c. Estimate and measure mass/weight, length, volume, and temperature using standard units. (Math SS-IV.1.3, SS-I.1.3, SS-III.1.3, SS-VIII.4.3) GLO: C2, C3, C5</p> <p>3-0-5d. Estimate and measure the passage of time using standard units. Include: seconds, minutes, hours. (Math SS-VI.1.3) GLO: C2, C3, C5</p> <p>3-0-5e. Record observations in a variety of ways. <i>Examples: point-form notes, sentences, simple diagrams, charts...</i> (ELA 3.2.1, 3.3.2, 4.1.3; Math SP-II.2.1, SP-V.2.3) GLO: C2, C6</p>	
Analysing and Interpreting	<p>3-0-6a. Display data using more than one way to represent the same data. (Math SP-III.2.3) GLO: C2, C6</p> <p>3-0-6b. Discuss data and generate new questions from displayed data. (Math SP-IV.1.2) GLO: A1, A2, C2, C5</p> <p>3-0-6c. Place materials and objects in a sequence or in groups using two or more attributes, and describe the system used. (Math PR-I.1.3) GLO: C2, C3, C5</p>	

	Scientific Inquiry	Design Process
Concluding and Applying	<p>3-0-7a. Draw a simple conclusion based on their observations. GLO: A1, A2, C2</p> <p>3-0-7b. Explain why conclusions related to classroom experiments should be based on multiple trials or classroom data rather than on an individual result. GLO: A1, A2, C2</p> <p>3-0-7d. Examine how new experiences, ideas, and information connect to prior knowledge and experiences, and record these connections. (ELA 1.2.1, 2.1.2, 3.3.3) GLO: A2, C6</p> <p>3-0-7e. Communicate results and conclusions in a variety of ways. <i>Examples: point-form lists, sentences, simple diagrams, charts, demonstrations...</i> (ELA 2.3.5, 3.3.2, 4.1.3; Math SP-III.2.3; TFS 2.1.4) GLO: C6</p>	<p>3-0-7c. Identify new problems that arise. GLO: C3</p>
Reflecting on Science and Technology	<p>3-0-8a. Recognize that valid experiments normally have reproducible results, which may vary slightly. GLO: A1, A2, C2</p> <p>3-0-8b. Recognize that scientists develop explanations from observations and what they already know about the world, and that good explanations are based on evidence. GLO: A1, A2, C2</p>	<p>3-0-8c. Recognize that designing a solution to a simple problem may have considerations, such as cost, materials, time, and space. GLO: B2, C3</p>
Demonstrating Scientific and Technological Attitudes	<p>3-0-9a. Listen to and consider differing opinions. (ELA 5.2.3) GLO: C5, C7</p> <p>3-0-9b. Express enjoyment when sharing and discussing science-related experiences from daily life. (ELA 4.4.3) GLO: C5</p> <p>3-0-9c. Take the time to repeat a measurement or observation for greater precision or detail. GLO: C5</p>	

Grade 3, Cluster 1: Growth and Changes in Plants

Overview

In Grade 3, the study of living things focuses on the characteristics and needs of plants and their growth patterns. Students observe and investigate local plants, but a deeper understanding and appreciation is developed through planting, nurturing, and observing individual plants over time. Connections are made to students' prior knowledge of animal needs (see *Grade 2, Cluster 1: Growth and Changes in Animals*) by identifying needs that are similar between plants and animals and how those needs are met. This cluster addresses the importance of plants to the environment as well as the significance of food, shelter, medicine, and other plant products to humans. Emphasizing the connection between this cluster and *Grade 3, Cluster 4: Soils in the Environment* develops the relationship between plants and the soils in which they are grown.

Students will...

- 3-1-01 Use appropriate vocabulary related to their investigations of growth and changes in plants.
Include: growing medium, nutrient, energy, root, stem, leaf, flowers, pistil, stamen, ovule, pollen, seed, fruit, adaptation, life cycle.
GLO: C6, D1
- 3-1-02 Observe, compare, and contrast the structure and appearance of several types of plants.
Examples: plants with different types of roots, trees with needles and trees with leaves...
GLO: C2, D1, E1
- 3-1-03 Show respect for plants as living things.
GLO: B5
- 3-1-04 Conduct experiments to determine conditions needed for healthy plant growth.
Include: light, water, air, space, warmth, growing medium, nutrients.
GLO: A1, C2, C5, D1
- 3-1-05 Recognize that a plant uses the Sun's energy to make its own food.
GLO: D1, D2, D4, E4
- 3-1-06 Use the design process to construct an environment that enhances plant growth.
Examples: window sill garden, terrarium, cold frames...
GLO: A5, C3, C5, D1

- 3-1-07 Identify the basic parts of plants and describe their functions.
Include: roots, stems, leaves, flowers, pistil, stamen, ovule, pollen, seeds, fruit.
GLO: D1, E2
- 3-1-08 Explain how different adaptations of plants help them survive in particular environments.
Examples: cacti have fleshy stems that store water, allowing them to survive in a dry environment; plants with tap roots can grow well in heavily compacted soil...
GLO: D1, D2, E1
- 3-1-09 Identify plant adaptations that can be harmful to humans, and describe their effects.
Examples: rose thorns cause painful punctures, poison in rhubarb leaves can cause sickness and death...
GLO: B3, C1, D1
- 3-1-10 Care for a flowering plant throughout its life cycle, tracking its growth and its changes over time.
GLO: B5, C5, D1, E3
- 3-1-11 Identify characteristics that remain constant and those that change throughout the life cycle of a flowering plant.
Examples: generally, for a given plant, the leaf shape and flower colour stay the same, whereas the leaf size and number of leaves change...
GLO: D1, E3
- 3-1-12 Identify needs common to plants and animals, and contrast how they meet those needs.
GLO: D1, E1
- 3-1-13 Describe ways that plants and animals depend on each other.
Examples: plants provide food and shelter for some animals, animals help distribute pollen and seeds...
GLO: D2, E2
- 3-1-14 Describe ways plants are important to the environment.
Examples: improve soil, air, and water quality; reduce erosion...
GLO: B5, D2
- 3-1-15 Identify and describe hobbies and jobs involving plants.
GLO: B4
- 3-1-16 Identify how humans from various cultures use plant parts for food and medicine.
Examples: use of roots for food (carrots) and medicine (ginseng)...
GLO: A4, B1, C5, E1
- 3-1-17 Investigate to determine how humans from various cultures make useful products from plant materials.
Examples: lumber milling, paper making, rope making, fabric making...
GLO: A3, A4, B1
- 3-1-18 Explain how humans replenish the plants they use and the consequences if plants are not replenished.
Examples: after loggers harvest trees, new ones should be planted to ensure a future lumber supply...
GLO: B1, B5, E3

Grade 3, Cluster 2: Materials and Structures

Overview

Students learn about the nature of materials not just by observing them but, more importantly, by using them. In this cluster, students experience the design process as they manipulate and test materials, build structures, and select and use materials suitable to the task at hand. Students find that the strength and stability of structures in their community, as well as those they build themselves, are linked to the properties of the materials used and to the particular way the materials are configured and joined. This cluster further develops the concept of materials introduced in *Kindergarten, Cluster 3: Paper* and built upon in *Grade 1, Cluster 3: Characteristics of Objects and Materials*.

Students will...

- 3-2-01 Use appropriate vocabulary related to their investigations of materials and structures.
Include: strength, balance, stability, structure, frame structure, natural structure, human-built structure, force.
GLO: C6, D3
- 3-2-02 Conduct experiments to compare the strength of common materials.
Examples: wooden toothpicks, plastic straws, paper, cardboard, polystyrene foam...
GLO: A1, A2, C2, D3
- 3-2-03 Explore to determine ways to strengthen a material used for building.
Include: changing shape, bulk, and number of layers.
GLO: B1, C2, D3
- 3-2-04 Explore to determine an appropriate method for joining two materials for a specific use.
GLO: C2, D3
- 3-2-05 Recognize that balance affects the stability of a structure.
Examples: a domino tower that leans to one side is more likely to tip over than one that stands straight...
GLO: D4

- 3-2-06 Explore to determine ways to improve the strength and stability of a frame structure.
Examples: use of triangulation or a cross member...
GLO: C2, D4, E2
- 3-2-07 Identify shapes that are part of natural and human-built structures from various cultures and describe how these shapes help to provide strength and stability.
Examples: cylinders, triangles, hexagons in outdoor playstructure, hexagons in a honeycomb...
GLO: A4, D4, E2
- 3-2-08 Identify characteristics of materials that need to be considered when choosing materials for building structures.
Examples: strength, flexibility, durability, surface texture...
GLO: D3
- 3-2-09 Use the design process to build a structure that meets given criteria related to strength, stability, and function.
GLO: A3, C3
- 3-2-10 Describe the effects of various forces on different structures.
Examples: bookshelf sagging under the mass/weight of books, tent blowing over in a storm...
GLO: D4, E2
- 3-2-11 Evaluate simple structures to determine if they are safe and appropriate to the user.
Examples: classroom furniture...
GLO: C1, C3, C4, D4
- 3-2-12 Investigate to identify hobbies and jobs related to construction, engineering, and architecture.
GLO: B4
- 3-2-13 Identify various materials used in the construction of buildings in their community and in communities around the world.
GLO: A4, B1, D3, E1

Grade 3, Cluster 3: Forces That Attract or Repel

Overview

In Grade 3, students build on their initial awareness of forces as pushes or pulls, (see *Grade 2, Cluster 3: Position and Motion*). In this cluster, the focus is on forces that act without direct contact: gravity, magnetism, and static electricity. Students describe evidence that shows that objects and living things on or near Earth are affected by a force called gravity, enhancing their understanding of the nature of science. Through their investigations, they determine that magnets have two poles and are surrounded by a magnetic field. They describe interactions of like and unlike poles, and compare Earth to a giant magnet. In addition, they identify ways of producing electrostatic charges using everyday materials. Students show how the strength of magnetic and electrostatic forces varies under different conditions. New understandings of gravity, magnetism, and static electricity are further refined as students identify and construct devices that use these forces.

Students will...

- 3-3-01 Use appropriate vocabulary related to their investigations of forces.
Include: force, attract, repel, gravity, magnet, magnetize, magnetism, north pole, south pole, magnetic field, compass, electrostatic charge, static electricity, electrostatic force.
GLO: C6, D4
- 3-3-02 Recognize that force is a push or pull and that attraction and repulsion are types of pushes and pulls.
GLO: D4
- 3-3-03 Describe evidence showing that objects and living things on or near Earth are pulled toward it by a force called gravity.
GLO: A2, D4
- 3-3-04 Predict and test to identify materials that are attracted by magnets and those that can be magnetized.
GLO: C2,, C5 D3
- 3-3-05 Investigate to determine how to magnetize a given object.
Include: contact with another magnet, proximity to a magnet.
GLO: C2, D4
- 3-3-06 Investigate to determine the location of poles on a magnet, and the shape of the magnetic field around a magnet.
GLO: A1, C2, D4

- 3-3-07 Demonstrate that opposite poles attract and like poles repel.
GLO: C2, D4
- 3-3-08 Explain why Earth can be compared to a giant magnet.
Include: Earth has a magnetic field with poles adjacent to the geographic poles.
GLO: D4, E1, E2
- 3-3-09 Demonstrate and explain how a compass operates by magnetism.
Include: Earth's magnetic pole attracts the magnetic needle of a compass.
GLO: B1, D4
- 3-3-10 Describe potentially harmful effects of magnets on magnetized materials.
Examples: computers, videos, credit cards...
GLO: B1, C1, D4
- 3-3-11 Describe and demonstrate ways to use everyday materials to produce electrostatic charges.
Examples: rubbing feet on carpet, brushing hair, rubbing a balloon on clothes...
GLO: D4
- 3-3-12 Investigate to determine how electrostatically charged materials interact with each other and with uncharged materials.
Include: charged materials attract or repel each other, charged materials attract uncharged materials.
GLO: A2, C2, D4
- 3-3-13 Identify ways in which problems associated with static electricity can be avoided or eliminated.
Examples: staying indoors when there is a lightning storm, grounding yourself before using computers, avoiding shuffling your feet on carpets...
GLO: B1, C1, D4
- 3-3-14 Investigate to determine the change in magnetic and electrostatic forces at different distances.
GLO: C2, D4
- 3-3-15 Predict and test to determine the effect of placing materials between a magnet and an attracted object and between charged objects.
Examples: different thicknesses of paper, glass, water, metal...
GLO: C2, C5, D4
- 3-3-16 Recognize that gravitational, magnetic, and electrostatic forces can move certain objects without touching them directly.
GLO: D4
- 3-3-17 Distinguish between motion that is caused without contact and that which is caused by contact.
GLO: D4
- 3-3-18 Identify devices that use gravitational, magnetic, or electrostatic forces.
Examples: balances, magnetic cupboard latches, dust mops...
GLO: B1, D4
- 3-3-19 Use the design process to construct a game, toy, or useful device that uses gravitational, magnetic, or electrostatic forces.
GLO: C3, C5

Grade 3, Cluster 4: Soils in the Environment

Overview

Soil provides a base for gardens, forests, fields, and farms, supporting plant and animal life, and human activities. By examining soils, students discover that soil composition and characteristics vary. Students also experiment to determine the impact of different soils on plant growth, thus improving their understanding of scientific inquiry processes. Students also learn the importance of animals and nutrient recycling to soil quality. Teachers are encouraged to help students develop the strong connection between soils and plants (see *Grade 3, Cluster 1: Growth and Changes in Plants*).

Students will...

- 3-4-01 Use appropriate vocabulary related to their investigations of soils in the environment.
Include: soil, soil component, loam, clay, sand, pebbles, organic matter, humus, rocks, sedimentation, sieving, water-holding capacity.
GLO: C6, D5
- 3-4-02 Identify and describe various components within a sample of soil from the local environment.
Examples: clay, loam, sand, pebbles, organic matter, humus, rocks...
GLO: D5
- 3-4-03 Explore to determine ways to separate soil components.
Include: sedimentation and sieving techniques.
GLO: C2, D5
- 3-4-04 Describe and compare components of soil samples collected at different locations and depths.
GLO: D5, E1
- 3-4-05 Compare the water-holding capacity of different soils.
Examples: sandy soil retains far less water than loamy soil...
GLO: D3, D5, E1

- 3-4-06 Describe the effect of water on different soils.
Examples: texture, cohesion, ability to hold shape...
GLO: D3, D5
- 3-4-07 Conduct experiments to determine how different soils affect the growth of plants.
Examples: compare the same type of plant grown in sand versus potting soil...
GLO: A1, A2, C2, D2
- 3-4-08 Explain the importance of understanding the characteristics of different soils.
Examples: enables farmers to determine which crops can be grown in a particular area, enables gardeners to improve plant growth, enables engineers to know what types of foundations to set for structures...
GLO: A5, B1, B5, E2
- 3-4-09 Identify animals found in soil and explain their importance to soil quality.
Examples: worms, insects, and mammals help to aerate the soil or increase nutrients...
GLO: B5, D2
- 3-4-10 Describe ways to return organic matter to the soil.
Examples: composting, spreading manure on fields...
GLO: B1, B5, D2, D5
- 3-4-11 Use the design process to construct a simple composter that returns organic matter to the soil.
Examples: classroom composter for left-over food, school composter for grass clippings and leaves...
GLO: B1, B5, C3, D2
- 3-4-12 Investigate how humans from various cultures use earth materials to make objects.
Examples: clay pots, sod houses, adobe bricks, glass...
GLO: A4, B1, B4